PC MAGAZINE **LIBRARY** STANDARD PERSONAL COMPUTING

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PC MAGAZINE

The Image of Success

New Scanners for Text and Graphics

OPTICAL SCANNER
NEWSLETTER

V.P. APPOINTED

- IBM's
8-MHz AT:
Too Little,
Too Late?

- Chart Your
Course with
Mapmaking
Software

PC
LABS

- 14 Remote
Emulators That
Speak SNA

We frequently surprise people with inventive, imaginative software, and people frequently surprise us with the way they use it.

For example, you'll read on this page how Michael J. Watkins of the Petroleum Technology Center in Houston, Texas, used Turbo Pascal® (and Turbo Graphix Toolbox™ and Turbo Tutor™) to cut down the tedium and time in creating Circular Performance Profile Charts (CPFCs).

We didn't know they existed, but you learn something new every day!

Applications like CPFCs might not fit your exact needs, but at the same time they might stimulate fresh ideas in your mind about how you can put Turbo Pascal and the Turbo Pascal family to work for you.

And thank you for your interest in and support for Borland International.

P Kahn

Philippe Kahn,
President, Borland International

Turbo Pascal deliberately programmed to go around in circles

Circular charts (or CPFCs) are used by Michael J. Watkins of the Petroleum Technology Center in Houston, Texas, to plot a single performance property for a large number of elastomers, which have elastic, rubber-like properties.

Mr. Watkins wrote us saying, "Because CPFCs condense a lot of data in one graphic, they can be very tedious and time-consuming to draw."

What he did to solve those problems was to write a Turbo Pascal program for IBM® personal computers to "generate these charts quickly and easily."

He used Turbo Pascal "because it has a companion set of very powerful graphics programs (Turbo Graphix Toolbox) which greatly simplifies the required programming."

Turbo Pascal is not a difficult language to use and can be easily learned by persons who can program in FORTRAN or BASIC. An excellent tutorial (Turbo Tutor) is available for the novice or experienced programmer. The Turbo Pascal products are also very moderately priced.

"The computer is no better than its program." *Elting Morison, author of "Men, Machines and Modern Times".*

CROSSTALK
XVI

PC MAGAZINE

Test and Graphics Scanning Techniques

How Voice Recognition Works

WHAT'S INSIDE

Tom Stanton

Mark Twain was the first major writer to use a typewriter, a Remington on which he wrote *Huckleberry Finn* in 1884. In the hundred years since then, a good deal has changed in the way we create text. But one thing remains stubbornly low tech: the keyboard. In fact, if you think about it, using a keyboard to create text is downright primitive.

Voice technology is beginning to offer a realistic alternative. But until voice-recognition devices can understand words the way most people speak them (fast), business users are unlikely to trade in their keyboards for microphones.

The greatest keyboard limitation is speed. Even power users who started out as typing stars in high school can't create text any faster than their fingers can carry them—about 70 words per minute. While 70 wpm isn't so bad for writing drafts, it's murder for converting paper copy—the waves of reports, summaries, news releases, memos, clippings, and excerpts that flood your office daily—to disk files. So most offices continue to organize, store, and retrieve such information the old-fashioned way: in acre upon acre of steel file cabinets.

The solution is scanners. This rapidly developing page-to-disk technology brings the efficiency of the PC to the problem of organizing, storing, and retrieving paper files. For a full report on the state of scanning technology and reviews of nine new products, see page 128.

Evaluating products in *PC Magazine* requires experts, lots of them. In this issue, for example, G. William Dauphinais and the Price Waterhouse crew bring the best expertise available to a review of *Open Systems Accounting Software*. Bill Harts, Charles Teets, and M. David Stone, three specialists equally comfortable on both ends of the micro-to-mainframe connection, illuminate the complex, increasingly more important subject of remote 3270 terminal emulation (page 235).

For some product categories, locating objective experts is especially difficult. There aren't, for example, very many scanner specialists around. Tom Stanton, who headed the review team for the scanner cover story in this issue, is such a specialist. Stanton's interest in these products is very personal: "I've always been fascinated by the idea that you could input pages of text without typing," he notes. "Like lots of writers, I have a file cabinet full of old writing that I wanted to store on disk. Since I'm a one-finger typist, scanners have real appeal." Even if everyone in your office is a power typist, we think you'll agree that scanners can be great productivity enhancers.

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THE
ENGINE

1-2-3

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REPORT
WRITER

FREELANCE

GRAPH
WRITER

THE 1-2-3
SYSTEM

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CONTINUOUS INNOVATION

INDEPENDENT SOFTWARE DEVELOPERS

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ETC.

When 1-2-3® was first introduced it quickly became the best-selling, best-working software in the industry. Today it's practically an industry all by itself.

An example: there are more than 1000 independent software developers who have created and continue to create specialized applications for 1-2-3 . . . steadily adding value to the product for people in all areas of business. Today 1-2-3 is the engine that drives an industry full of software tools designed for such specialized jobs as construction management, tax planning, business modeling and more.

Add to this Lotus supported companion products such as 1-2-3 Report Writer,™ Freelance,® GraphWriter®–and soon-to-be available products such as Lotus HAL™ and others–and it's clear that you're looking at an entire *system* of products to help you work more productively with 1-2-3.

All of which makes 1-2-3 better than it ever was.

About a *thousand* times better, in fact.

Learn about the 1-2-3 system and how it can work for you. Talk to an authorized Lotus dealer.
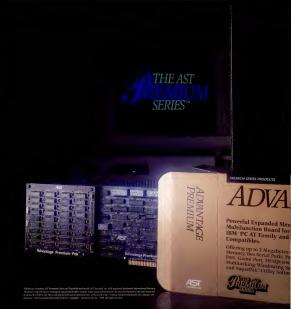
Lotus 1-2-3

The business software integrating spreadsheet, graphics and database.

ge Premium.™
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Now AST translates the power and speed of AT-class computers into increased productivity...delivering on the promise of advanced technology with expanded memory and multifunction features.

More Features. Advantage Premium offers up to 2 MB of expanded memory, two serial ports, a parallel port, a game port, AST's SuperPak™ utilities, and DESQview™ windowing/multitasking software.

Expanded Memory. With our enhanced Lotus®/Intel®/Microsoft® compatible expanded memory, you'll be able to run larger, expanded memory spreadsheet, database and integrated applications. And with this much memory you can even create huge RAM disks and print buffers.

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SERIES

In XENIX® and Unix® environments Advantage Premium's memory can be used as extended memory.

You'll Work Faster. Advantage Premium's flexible DESQview operating environment lets you organize up to nine of your current and new expanded applications in memory for faster, easier access.

With your applications in Advantage Premium's memory you'll toggle from application to application, transfer data between programs, and execute multiple tasks at the same time. And you'll avoid time-consuming workflow interruptions like diskette changes and closing down one application to open another.

AST Is The Standard. Buying from AST, the largest producer of PC enhancements, you're assured compatibility. Whether you have an IBM, Compaq® or other compatible system, you'll find AST provides the same high-quality service and support that have made us number one.

Take Delivery On The Promise. Visit an AST Authorized Dealer today and ask for Advantage Premium. For more information call our Product Information Center **(714) 863-1480.** Or send the coupon to AST Research, Inc., 2121 Alton Avenue, Irvine, CA 92714-4992.

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LETTERS TO PC MAGAZINE

PROJECT DATABASE II

We were a bit surprised by your treatment of our product *filePro 16 Plus* ("Programmable Relational Databases," *PC Magazine*, Volume 5 Number 12). Both the table and the review contained several errors and misleading statements.

For instance, the table should have indicated that floating-point calculations and date conversions are features built into *filePro 16 Plus*. In addition, *filePro 16 Plus* features predefined mailing labels and data import/export for DIF, SYLK, and user-defined data.

I also find the comparison between the *filePro 16 Plus* procedural language and dBASE slightly misleading. dBASE is more or less a programming language, while *filePro 16 Plus* is menu driven. Thus, *filePro 16 Plus* does automatically many jobs that you must program in dBASE.

Our biggest surprise, however, was John Phillips's complaint that *filePro 16 Plus* is complicated. Only once did he mention that complexity relates to flexibility. Flexibility was our goal with *filePro 16 Plus*, which we would never recommend to novices. Instead, we suggest that users start with *filePro 16* and upgrade to *Plus* only if they need the extra development features.

Sherry Gench
The Small Computer Co.
New York, New York

John Phillips replies:
As I stated in my article, filePro 16 Plus *is feature-rich and fast, and it contains several slick features. However, I found that the product was outclassed by the five other Category 3 (programmable relational databases) products I reviewed.*

PROGRAMMABLE RELATIONAL DATABASES

I believe a modern system shouldn't have to be told to remain in drive C: after being installed in that drive. And no software should require ten new subdirectories just to install the system and a tutorial. To me, these things are important in a $900-plus product.

Since you like *R:base Series 5000* enough to make it your Editor's Choice in "Programmable Relational Databases," perhaps you would be willing to buy my copy. I purchased this program because of the favorable press it has received, however, upon reading the documentation and working with the program for several days, I discovered *R:base Series 5000* is unsuitable for anything but the simplest database tasks.

For example, I was initially led to believe that the program would allow me to have 40 distinct tables, each having a maximum of 400 fields and 1,532 bytes per record. Unfortunately, I discovered that the 400 fields and 1,532 bytes are absolute maximums, which must be shared among all of the tables. How is it that the reviewer could omit mentioning such vital, and potentially crippling, limitations?

Paul H. Hooverson
Recourse Computer Services
Fort Collins, Colorado

Vincent Puglia replies:
Your figures are correct; I am sorry we assumed R:base Series 5000 *allowed 16,000 fields and 61,280 bytes per database. However, your problem may have arisen from the assumption that tables, files, and databases are one and the same.*

As for R:base Series 5000 *being unsuitable for serious database tasks, it may be that your applications require more power. If that is the case, you either need to get a more powerful database (the new version of* R:base Series 5000—R:base System 5—*allows 800 fields per record and 4,096 bytes per field or record. If you purchased* R:base Series 5000 *after January 1, 1986, the upgrade costs $99) or redefine your application.*

Congratulations on your database reviews in "Programmable Relational Databases." *R:base Series 5000* deserves to be an Editor's Choice. As a productivity tool with full-power features for business and professional use, *R:base Series 5000* is clearly the new database standard.

R.J. Lahey
St. John's, Newfoundland

We were very disappointed with Bill Harts's review of the *VersaForm XL* database in "Programmable Relational Databases." In the entire review, no mention was made of its detail lines, the one feature that sets *VersaForm XL* apart from and above every other database we have used. Detail lines allow the user to create columnar fields that will add a new line every time a current one is used. This is an invaluable tool for generating accounting applications. Although we realize it is possible to program other databases to emulate

When It Comes To A Portable PC, Smaller Is Better.

VIEWPOINTS

■ LETTERS

this concept, we prefer to stick with Versa-Form XL and avoid that complicated and time-consuming process.

Steven Tablak
Tamtron
San Jose, California

A VOTE FOR ENABLE

As one who has been using Enable software for more than a year, I was quite interested to read Alfred Poor's comparison of this outstanding package with Framework and Symphony ("Integration with Integrity: Framework, Symphony, and Enable," PC Magazine, Volume 5 Number 11). His review confirms my opinion that Enable is the cream of the crop. I agree with his comment that Enable is the one program to do it all. It certainly has for me.

John M. Shinala
Cumming, Georgia

HUNG UP IN SETUP

I recently downloaded the SETUP.COM program, a utility that lets you send setup control codes to your printer (Programming/Utilities, PC Magazine, Volume 5 Number 12), and I must say it is fast becoming a favorite. However, the combination of SETUP.COM, SuperKey, and

■ As a productivity tool with full-power features for business and professional use, R:base Series 5000 is clearly the new database standard.

SideKick brings my system to a screeching halt. In stripping off the programs to locate the exact cause of the problem, I discovered that it occurs when SETUP.COM is running with SuperKey. Is this a problem of incompatibility among multiple memory-resident programs, or is it a problem unique to my system?

Robert B. Fairley
Stamford, Connecticut

■ LETTERS

Incompatibilities among memory-resident programs—especially those like macro generators—are so rampant that a number of software manufacturers recently convened to see if some order could be im-

posed on the chaos. Reportedly, one major company even offered to put its proprietary keyboard handler into the public domain if others would use it to eliminate the conflicts.

Although this and alternative ways to manage multiple memory-resident programs are being explored, at the moment there is no simple answer. We're sorry if some of our program offerings can't coexist with some of our readers' favorite commercial packages (and we will report known conflicts), but we can't always undertake to resolve them.—Ed.

> ■ SETUP.COM, which lets you send setup control codes to your printer, is fast becoming a favorite.

TEPID TESTING

In his editorial column "The Product Intro Dilemma" (*PC Magazine*, Volume 5 Number 8), Bill Machrone stated that *PC Magazine* works "extensively with manufacturers under nondisclosure agreements," which he said reflected an "If we don't test it, we don't write about it" policy. But I have noticed that, with the exception of your product category–specific evaluations (for example, Project Database), the reviews are almost as strong as a warm milk.

I recognize that *PC Magazine* is caught in the middle, serving two masters. On the one hand, *PC Magazine* wants to ensure that consumers continue to read its reviews. On the other hand, it wants to ensure a steady supply of products to review, for surely you don't actually pay for all the products you write about.

The raison d'être of publications such

as yours is not to supply blurbs for product ads: it is to supply information to consumers who want to spend money on useful products. Most products have foibles as well as fortes; let us know what they are.
Bradford S.J. Young
Charlottesville, Virginia

Bill Machrone replies:
Right now, at least half a dozen manufacturers who have gotten bad reviews would beg to differ with us. We stand on our record.

CORRECTIONS

The correct phone number for General Optimization (*PC News*, page 36, *PC Magazine*, Volume 5 Number 13) is (800) 441-BEST or (312) 248-7300.

In a response to a letter to PC Advisor (*PC Magazine*, Volume 5 Number 6), we incorrectly stated that Microwriter was no longer on the market. Although reorganization halted Microwriter's operations in North America, the product is still available in the United States at a price of $499 and can be ordered from Futur Soft Inc., Rte. 11, Mooers, NY 12958.

The correct phone number for Software Systems Technology Inc. ("Programmable Relational Databases," *PC Magazine*, Volume 5 Number 12) is (301) 779-5486.

The review of XDB ("Relational Databases," *PC Magazine*, Volume 5 Number 12) should have been placed in Category 3 (programmable relational databases).

HOW TO WRITE TO PC MAGAZINE

Do you have a comment, compliment, or criticism about something you've read in *PC Magazine?* A question you'd like to open up to other readers? Then send a letter or disk to Letters to PC Magazine, One Park Avenue, New York, NY 10016, or send your comments through MCI mail to PCMAGAZINE at address 157-9301. We're sorry we're not able to answer letters personally.

All letters become the property of *PC Magazine* and are subject to editing. We cannot publish letters that do not include a name, address, and phone number for verification.

TODAY's TOP QUALITY AIDS TO PROGRAMMING PRODUCTIVITY

Shopping List for the Power Workbench

■ GUS VENDITTO

PC ADVISOR

Help for readers in avoiding legal problems when setting up a network and in keeping detailed records of computer use for internal operations or for generating invoices.

A BAD WAY TO START A NETWORK

My clients are confused as to copyright law and the number of applications programs they must buy per network. Since we networking as a way to save money on software.

Is it illegal to buy one copy of a program and have it available to others on the network without the publisher's permission? Since the illegal copies of the program are stored in RAM, they disappear when the computer is turned off. Violations of copyright law by network users are nearly impossible to prove.

Douglas W. Baty
Sacramento, California

Your clients are being penny-wise and pound-foolish. At the same time copy protection is coming off many programs, software publishers are stepping up efforts to catch software cheats.

U.S. copyright law expressly prohibits the copying of software programs; the only permissible copy is a personal backup. Under common law, the licensing agreement printed on software packages may not be binding (that's an issue that lawyers could argue over), but some states are in the process of passing laws that codify and legitimate these licenses. Illinois and Louisiana have already done so.

Proving a case of illegal copying is very easy to do: testimony by employees about their work on the network would make excellent evidence. In fact, in virtually all the cases in which software publishers have obtained out-of-court settlements from businesses for unsanctioned copies, the

publisher was alerted by a disgruntled former employee.

(There are a few publishers that condone sharing. Borland International's license agreement allows use "by any number of people . . . so long as there is no possibility of it being used at one location while it's being used at another.")

In addition to the legal problems, non-networked software can turn into a logistical nightmare on a network: multiple accesses to a file can cause confusion and irretrievable data loss. Many software publishers are marketing networked versions of their programs. For example, R:base System V is sold as networked or personal software for the same price.

Considering the great legal expense a business faces if it's caught using copies and the risk of being "turned in" by discontented staff, buying the software you need is a prudent investment.

> ■ At the same time copy protection is coming off many programs, software publishers are stepping up efforts to catch software cheats.

TRACKING PC USE

I'm interested in tracking the use of 100 PCs. I would like the program to be user friendly, RAM resident, and able to list use by time and type of application.

Jeff J. Riddle
Greensboro, North Carolina

Simple, undetailed logs of computer time can be created by writing your own batch file. A bare-bones approach was demonstrated in PC Lab Notes (PC Magazine, Volume 5 Number 6).

We've looked at programs that not only purport to log time used, but compute idle time as well; unfortunately, they are too buggy and crude to recommend.

An applications organizer that is an excellent management tool for tracking the activities of a sizable work force is Direct Access (Delta Technologies, Eau Claire, Wis.; (715) 832-0958; $89.95). Centered on a password-restricted access core, it organizes applications into a menu while storing fairly detailed usage logs, including summaries for each application.

Businesses that generate invoices based on PC work will love TimeSlips (Northern Edge Software, Hamilton, Mass.; (617) 468-7358; $99.95). It records usage, calculates billing rates, and has an array of features that will aid in printing mailing labels, usage charts, and detailed, professional-quality invoices.

ASK THE ADVISOR

Send your questions to the PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016.

"We recommend Diagraph highly and believe its high-resolution spline graphics will become the standard others must match."

— *PC Publishing*, July 1986

Maps

Graphic Aids

Pictorials

"... Computer Support Corporation has pioneered the use of a new high-resolution technique in their latest package."

"... Diagraph is designed primarily as a business graphics package to prepare presentations, reports, charts, and diagrams. Computer Support Corporation clearly understands the needs of business graphics users and feature sets this product to accommodate dozens of plotters, dot matrix printers, film recorders and laser printers. Each output device is pushed to its upper graphics limits using Diagraph."

"... Unless you use a graphic artist or have lots of time to draw your own images, the symbol libraries are an invaluable asset. Over 2,200 symbols (far exceeding any other graphics package) are included in the price along with 13 different text fonts. As if that were not enough, Computer Support has over 5,000 additional symbols and 24 high resolution typefaces available for a nominal fee."

"... Diagraph uses 'object-oriented' symbols and fonts which are stored as lines and curves, substantially reducing disk storage space. This method allows text and symbols to be sized, rotated, stretched, etc. Then a

bit-mapped image is generated for your output device."

"... Another feature that will surprise laser printer users is the ability of Diagraph to print, size, move, and manipulate text in the same way you move symbols. Text output is just as sharp whether rotated, horizontal or even upside down. Most laser printer software products do not allow this degree of text manipulation."

"... Diagraph is an incredible aid to any Hewlett-Packard LaserJet owner that needs to produce high-quality material suitable for reproduction. It allows the average business high-quality professional graphics at a modest cost."

Diagraph is available for the IBM PC/XT/AT, IBM 3270 PC/XT, IBM compatibles and HP desktop computers.

Suggested retail: $395

Typefaces

Icons

Average Rainfall
Inches Per Year

U.S. Rainfall 1971-1985

1979
1980
1981
1982
1983
1984
1985

EGA Mode   Plantronics Mode

Finally, An EGA Car Responds To Yo

Introducing The Paradise AutoSwitch™ EGA Card.

You've decided you want an EGA Video Card because it offers the best quality text with high resolution color graphics. The problem is that older versions of popular software, like Lotus 1A, (and some current versions too) won't work with the EGA standard. That's a problem because in the course of your workday you'll need to use software written for different video modes.

Paradise has the answer. The Paradise AutoSwitch

EGA works with every popular PC video mode. And is smart enough to switch to the right mode every time you change programs. Automatically.
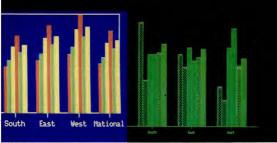
AutoSwitch. Only Paradise has it.

The Paradise AutoSwitch EGA changes video modes automatically to work with your software. No Mode commands. No special software to run. On RGB monitors it "autoswitches" between EGA, CGA (IBM Color Graphics) and Plantronics modes; on monochrome

monitors between EGA, MDA (IBM Mono Text) and Hercules modes. The Paradise AutoSwitch EGA runs any PC software you want. Immediately. Automatically. That's something ordinary EGA Cards can't do.

Runs all EGA, CGA, MDA and Hercules Software with true hardware level compatibility.

True hardware compatibility makes the Paradise Auto-Switch EGA Card different from other EGA Cards. No other EGA Card offers the

CGA Mode Hercules Mode

d That Automatically
ur Every Mode.

6845 CRT controller included in the IBM Monochrome, IBM Color and Hercules Cards. The Paradise-designed PEGA video controller chip has the equivalent of a 6845 inside. That means when the Paradise AutoSwitch EGA runs EGA software, it's an EGA card; when it runs IBM Color Graphics (CGA) software, it's a CGA card; when it runs Hercules software, it's a Hercules card. No "batch files," special software or complicated installation. No incompatibility hassles. EGA with true 6845 hardware compatibility. Only

from Paradise.

The Simpler the Better.

Paradise's exclusive Auto-Switch feature and true 6845 hardware compatibility make using the Paradise AutoSwitch EGA simple and hassle free. The Paradise-designed single chip EGA video controller makes possible all this functionality and intelligence on a short card. In fact, even the users manual is short. Only 24 pages.

The Paradise AutoSwitch EGA Card. Just what you would expect from the Video

Technology innovators.

PARADISE
S Y S T E M S, I N C

PC MAGAZINE

FIRST LOOKS

Store-Label PC's Shake Up Market

PC HANDS ON

BY WINN L. ROSCH

Armed with the double-barreled benefits of lower prices and IBM's own secret weapon—super support—two leading PC retailers, ComputerLand and Businessland, hope to cash in with house-brand computers.

Backed by nationwide dealer networks, both the Computer-Land BC88 and the Wyse PC286 by Businessland promise you the added measure of peace of mind: someone nearby who can service what he sells, and someone you can call upon when something goes wrong—at the price of only a local call.

The ComputerLand BC88 is a throwback. Unlike almost every other PC compatible now marketed, it's a bus-oriented computer reminiscent of the S-100 machines of yesteryear that were eclipsed long ago by the PC fireball.

The BC88 has no system board per se. The deceptively simple and well-made system unit is lined with a row of eight edge connectors, six of them using an AT-style, 16-bit bus, with the rest matching the PC standard. All system board functions are squeezed onto two normal-size expansion boards.

This unusual architecture makes the BC88 unusually flexible and allows your Computer-Land dealer to customize each system to your heart's (and budget's!) content. In fact, the whole personality and power of the system can be changed with the ease of replacing a few multifunction cards. The PC-compatible BC88 can thus be upgraded into an AT-compatible BC286 by substituting a three-board 80286 CPU board set for its two-board 8088-2 set. (No provision is made to expand into 80386 territory.)

In the BC88, one board is the actual central processing unit and the other a multifunction card, supplying system memory (up to 640K bytes; 256K is stan-

PC's Ltd. Breakthrough: 16-MHz, $2,995 Screamer

PC HANDS ON

BY PAUL SOMERSON

Michael Dell, the innovative 21-year-old chief executive officer at PC's Limited, has just thrown the high end of the industry for a loop with his 286 16, an AT-compatible micro that outperforms everything else in sight—and may just give the first round of 386 machines a run for their money.

If you've ever daydreamed about climbing into the computer equivalent of an F-18 jet, punching the throttle, and blasting straight up into the clouds, sit yourself down in front of one of these. Beside it, any other AT compatible is a Piper Cub. And everything else is just walking in lead boots.

This 16-MHz screamer tore the top off every test PC Magazine Labs threw at it. Dell's motto is "Give 'em what they want." And what they get is rock-solid construction in a

For $1,000 less than a comparably equipped IBM PC AT, PC's Limited offers a 16-MHz 286. The firm now has 8-, 10-, 12-, and 16-MHz AT compatibles.

compact box, clever design, a very high level of IBM compatibility, neck-snapping speed, and a competitive price tag.

Greased Lightning

After a few hours at 16 MHz, a lumbering IBM AT feels like a dusty relic from a computer museum. On the 286 16, screens popped like flashbulbs. Software sprinted through ordinarily languid tasks at a dizzying pace; you have to see *WordStar* at 500 miles per hour to believe it. The *1-2-3* WAIT message would get only as far as WA. Even Microsoft products ran with uncharacteristic zip.

Just Under $3,000

Dell is selling a megabyte of 70-nanosecond DRAM, a 16-MHz AMD 80286 CPU, 8-

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Photograph: Thom O'Connor

PC LABS

The ComputerLand BC88 and Businessland's Wyse PC286 vs. the IBM PC XT

- ☐ ComputerLand floppy disk
- ☐ Businessland floppy disk
- ■ IBM PC XT floppy disk
- ■ IBM PC XT hard disk
- ☐ ComputerLand hard disk
- ☐ Businessland hard disk

Normalized times
Ratio: IBM PC XT = 100%

Disk I/O (576 bytes)			Prime-Number Calculation Routine	Compiler Routine	dBASE Routine	1-2-3 Routine
Write	Sequential read	Random read				
127.92	127.45	287.12	N/A	N/A	N/A	
123.89	121.32	299.23	N/A	N/A	N/A	
100.00	100.00	100.00	N/A	N/A	N/A	
100.00	100.00	100.00	100.00	100.00	100.00	
54.00	208.10	89.62	49.30	74.98	77.62	72.73
37.92	166.12	45.46	14.80	25.76	26.06	31.31

The Disk Input/Output benchmark test measures the time it takes to create a 256-byte data file using record lengths of 512 bytes and 576 bytes. The first program then performs a random read of 256 records from the created data file, followed by a sequential read of the same records.

The Prime-Number Calculation benchmark test measures the speed at which the computer can find all the prime numbers between 1 and 500.

The Compiler Routine benchmark test assesses the speed of program development in the microprocessor and RAM by way of a two-step, self-timing C-82 batch program using the IBM Personal Computer Linker program. Stage 1 takes a 34H assembly code file (.ASM), converts it to binary code, and link-edits it with other binary files to make an executable (.EXE) file. Stage 2 compiles and links source code to resolve address references and make an executable file.

The dBASE Routine benchmark test assesses how quickly the machine reads and writes to disk by performing a series of dBASE II, Version 2.4, tasks. The program runs the DOS batch file runs six dBASE routines on 81 individual database records consisting of 52 bytes each: sorting on a database file (.DBF), indexing on 2 of the 13 data fields in each record, copying to a temporary database file, sorting two indexes on a database file, appending a record, and deleting a record and packing the database file.

The 1-2-3 Routine benchmark test for spreadsheet applications, designed for a 640K-byte environment, assesses the computational speed and RAM management capabilities of the machine by using a 1-2-3 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-cell range 499 times, moves 1,000 cells, deletes 1,000 cells, and then systematically clears the spreadsheet.

House Brands

dard equipment), a parallel port, a serial port, a clock, and a floppy disk controller. Other manufacturers' multifunction boards cannot be substituted.

Outside of the unusual internal layout, little else is remarkable about the BC88. Its two-speed, eight-bit processor performs on a par with an ordinary PC (at a 4.77-MHz clock speed) to about 1.7 times faster (at 8 MHz), according to Norton's SysInfo test.

The BC88 comes complete with GW-BASIC and MS-DOS 2.11, but the latter caused the only incompatibility I encountered with the computer. When I formatted its hard disk with that operating system and later booted the machine with PC-DOS 3.2, writing to the hard disk destroyed the file allocation table. Although the problem is probably software-related, I would be wary of mixing operating systems on the BC88.

The BC88 has a mixed parentage. Although it bears the ComputerLand label, the machine is imported by GreatWest Technology, a wholly-owned ComputerLand subsidiary. The hardware is actually made in Korea by Tri Gem, and the ROM BIOS bears a copyright notice attributing it to PCPI.

The Wyse PC286 by Businessland is an unabashed AT clone. Although on the outside it's refreshingly different—painted a richer beige color and displaying a beveled control panel—inside it features the IBM AT layout we've all grown fond of: eight expansion slots (six with full 16-bit bus) and two drive bays, one dedicated to a full-height hard disk and the other capable of handling up to three half-height devices.

The Wyse-cum-Businessland processor is an 80286 with two speeds, switchable by a front-panel pushbutton or through DOS. The slow speed is an AT-compatible 6 MHz that delivers a performance rating of 5.9 on Norton's SysInfo test. High speed is a blazing 10 MHz (with one wait state). Remarkably, at that speed the PC286 scored a whopping 16.7 to 20.0 on SysInfo.

One clever design aspect ensures that the PC286 will be compatible with the widest vari-ety of accessories. Even when high-speed operation is selected, the clock speed of the data bus is held to 6 MHz, except when memory is accessed. Hence, no high-speed stress is forced onto other system peripherals, and only memory expansion cards need be capable of handling 10 MHz.

A full 640K bytes of RAM is standard, as are a clock and GW-BASIC (but not MS-DOS). Parallel and serial ports are optional, as is DOS.

A 1.2-megabyte floppy disk is operated by an IBM-style Western Digital combined floppy-and-hard disk controller come standard. The Seagate 20-megabyte hard disk in the evaluation unit matched the speedy 80286 microprocessor well and turned in a 34-millisecond average access time.

Equipped with a Phoenix ROM BIOS, the Taiwan-made Wyse PC286 for Businessland is commendably compatible. I encountered no problems with any IBM software, whether running the MS-DOS 3.1 operating system normally supplied by Businessland or PC-DOS 3.2.

PC's Ltd. 286 16

(continued from page 33)

MHz DMA, a 200-watt power supply, eight expansion slots (one of which is filled by a combination hard/floppy disk controller), a 1.2-megabyte floppy disk, and an AT-style keyboard, for $2,995. You can substitute a 360K-byte drive for $26 less. (A 12-MHz version goes for $2,695, but no power user in his right mind will want it since $300 kicks the performance up a whopping 33 percent.)

Small but Roomy

On the outside, the 286 16 closely resembles its 12- and 10-MHz siblings right down to the LED ticker-tape SmartVu display adjacent to the lock. It's available in the now-standard small-footprint box, which holds up to three half-heights, or in a larger IBM-sized chassis, which can shoehorn in more or larger drives.

While the slower PC's Limited AT versions default at boot-up to a 6-MHz clock speed, the 286 16 starts out at 8 MHz. You can add a short program to your AUTOEXEC.BAT file to crank it up to 16 MHz, or you can tap out a Ctrl-Alt-Backslash at any time to toggle back and forth. An internal DIP switch lets you reconfigure the steady power-on front-panel light so it blinks only when in turbo mode.

A Different Breed

Under the hood, the 286 16 is far different from other hardware stamped out by PC's Limited—or anyone else. A massive heat sink surrounds the CPU to cool it down. A generation of new support CMOS chips fans out from it to shuttle data at a rapid clip. A 14-pin DIP-compatible oscillator, rather than the standard two-lead crystal-in-a-can, drives the clock. And a sleek new BIOS handles all the details. (On our early test model, someone had scribbled a single word on the labels atop the BIOS chips—*Ultra*. The description is apt.) PC's Limited wrote a large chunk of the BIOS itself.

The machine we tested came with the PC's Limited EGA card (a real value at $269) and a

crisp $479 Mitsubishi ECD monitor with color handling as good as any we've seen. It also sported two half-height 40-megabyte disk drives: a 35-millisecond version from Tandon sells for $895; or you can order a 40-millisecond, 40-megabyte drive from Seagate for $819. (However, neither drive was exactly what you'd call nimble.)

The standard AT-style keyboard was a bit mushy for those accustomed to heavy IBM springs. I plugged my IBM-issue keyboard into the back of the PC's Limited, and it worked just fine. One nice touch: on the underside of the feather-light PC's Limited Maxi-Switch keyboard is a toggle that lets you put the Esc key back where you're accustomed to finding it. Dell expects to have a new 101-key IBM-compatible keyboard (and some other bold announcements) by September.

20- and 24-MHz Versions

Although Dell admits he's toiling away on 20- and 24-MHz versions, he says there's more to the speed problem than just brute force. "We don't believe in just turning up the clock to make it go faster. We believe in integrating all the I/O relative to the speed."

He runs his DMA at half the clock speed of the central processor; competitors like IBM and Intel choke it down to a quarter. Dell claims his 12-

MHz machine runs nearly as fast as some of the better-known 80386 boxes just coming on the market, and that this new 16-MHz machine actually runs 20 percent faster than some 386s he's tested.

In fact, Dell and his chief scientist, Jay Bell, ascribe much of the success of the 286 16 to advanced design work for a generation of 386 machines they're readying for the market.

Nothing but the 386

Dell claims that "no other innovative engineering is going on in the PC business." If you think that sounds like puffery, look at the glut of me-too hardware on the market and try writing down everything that's truly new. Short list.

And, according to Dell, "This is only the beginning. While the 286 12 is okay and the 286 16 is pretty good, our researchers in Austin are working on a brand-new standard—a whole new approach in areas like disk access that will give you speed multiples eight to ten times greater a year or two down the road."

From some other manufacturers such a statement would be pure vapor. But after prying myself away from his beige blinker, I'm a believer; not all the rockets from Texas say NASA on the front. Bargain-basement clones are nibbling away at the PC marketplace, but the hearts and minds of corporate America

are still in a gluelike IBM grip. It's going to take machines like the 286 16—which offer breathtaking performance gains and irresistible value—to wrestle them free. 🖋

	NOP operating 128K bytes	Floating point calculation	Norton's Sysinfo
IBM 8-MHz PC AT 8-MHz Mode	4.17	(2.42)	34.41	(4.51)	(7.02)
PC's Limited 16-MHz PC AT 16-MHz Mode	2.09	(4.46)	16.72	(9.28)	(15.17)

Note: test results of the IBM 8-MHz PC AT and the PC's Limited 286 16 running in 8-MHz mode were identical. All times in seconds. Figures in parentheses indicate performance index relative to IBM PC (Ratio IBM PC = 1).

NOP
The 128K NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

FLOATING POINT CALCULATION
The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentials, and logarithmic and trigonometric functions. The test program uses the floating-point library routines included with Microsoft C 3.0.

NORTON'S SYSINFO
Sysinfo is a widely-used speed test that is sensitive to processors with pipelined architecture, such as the NEC V20 and the 80286.

The $2,995 PC's Limited 286 16, when operating in the 16-MHz mode, is twice as fast as a stock IBM PC AT, which can only reach a clock speed of 8 MHz. This machine had no incompatibility problems running any of the software we tested.

New World Writer: Helping Hand for Writers

PC HANDS ON

BY CHARLES BERMANT

The distinctions are starting to blur. PC word processors can usually be put into one of three categories—personal, professional, and corporate—but the document-oriented *Webster's New World Writer* falls somewhere between professional and personal. It is faster and more powerful than the best personal systems, like *PFS:Write*, but it lacks functions like mail-merge and the ability to window files.

Still, professional writers should find that this $150 package compares favorably with both *XyWrite III Plus* and *WordPerfect*. It includes versions of the powerful *Webster's New World Spelling Checker* and *Webster's New World Thesaurus* (altered so they can be used only with *New World Writer*).

On the $150 Webster's New World Writer, the Esc key brings up the command line. You can type the first letter to choose the command, or move the cursor and press Enter.

New World Writer is remarkably easy to learn. The Esc key brings up the command menu. Commands can then be entered either by moving the cursor over the command and striking the Enter key or by typing the command's first letter. Or if you're

working in the document, the commands can also be accessed through Alt key combinations, such as Alt-B for bold or Alt-U for underline.

Boldfacing and underlining show up on-screen, as do double-high spacing and right-

margin justifying.

Included with *New World Writer* are guides to word usage and hints on word processing applications. Speed word-frequency and word-counting programs are built in.

The spelling checker requires the file to be saved before checking, and if the first two letters of a misspelled word are transposed, the program is often unable to offer an alternative. The

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Easy 1.5 Adds Mailing Lists

PC HANDS ON

BY BILL HOWARD

Two segments of the word processing market should be delighted with the latest version of MicroPro's *Easy*: people who need a ready-to-go, idiot-proof mailing-list/mail-merge option, and those users who need to plug the results of any Lotus spreadsheet in the middle of a letter or proposal.

Easy came out last fall as a $149.95 competitor to *PFS:Write* in the personal word processor arena for casual users. If *Easy* lacked the elegant simplicity of *PFS:Write*, it offered a few more features and the ability to work with documents created with *WordStar*,

MicroPro's aging warhorse.

Version 1.5 brings a bit more speed, a bigger spelling checker (87,000 words instead of 65,000), and more printer support in its two versions: *Easy* (now $99) and *Easy Extra* ($149.95), which adds the EasyMail list manager and mailing-list program to *Easy*.

EasyMail is a simple database with 23 predefined fields (you can't create any of your own, but the ones you need are probably included), adequate sort and report capabilities, and the ability to print directly to commonly used mailing labels and business envelopes. No one will mistake EasyMail for *dBASE III Plus*, but it takes only 10 minutes to learn and three keys (Esc, F1, and F2) to use.

(continued on page 38)

Easy's Nice, but Where's WordStar 4.0?

SAN RAFAEL, Calif.—In the midst of reports of a declining market share, Micro-Pro International Corp. has mobilized "a very large development team" for the next upgrade of *WordStar*, the program that put Micro-Pro on the map.

The last major *WordStar* upgrade, from Version 3.24 to 3.30, was a lifetime ago—as computer programs go. In April 1983. That may be a record for a major program to endure without enhancements.

"Look for a new *WordStar*—Version 4.0—by year's end," says Lee Lensky, MicroPro public relations manager. "The intent is not to catch up but to go ahead—to enhance the product and still have it be *WordStar*, recognizable to

our users."

The *WordStar* trademark dot and block commands will remain, Lensky says. *WordStar*, Version 4.0, might contain a version of the *Word Finder* thesaurus; also, better on-screen formatting and an undelete command are probable.

Lensky says reports of *WordStar*'s demise are promoted by competitors "who want to see the product die."

"But," says dealer John Williams of Software Specialists, in Washington, D.C., "MicroPro's retail penetration by local reps is abysmal. MicroPro might have a good product, but it will never get its due because of poor marketing techniques. They're gotten lazy in their marketing." —Charles Bermant

Microsoft C Compiler 4.0 Adds Full-Screen Debugger

PC **HANDS ON**

BY CHARLES PETZOLD

Weighing in with seven disks and three manuals boasting 1,400 pages of documentation, Microsoft Corp.'s new C Compiler, Version 4.0, continues the high standards set by the previous Version 3.0.

The new version offers improved optimization and better recovery from cascading errors. In addition to the small, medium, and large memory models, Version 4.0 adds the "compact" model (which allows 64K bytes of code and multiple data segments) and the "huge" data type (which allows arrays to exceed the 64K limit).

The extensive collection of library functions has been expanded for greater compatibility with UNIX System V and the emerging ANSI C standard (and to provide two versions of a header file when these two standards conflict). Additional memory allocation functions manage the huge data type.

Functions to convert between Microsoft BASIC floating-point format and the IEEE format used in the C Compiler allow C programs to easily access data files created in BASIC containing floating-point numbers. Source code for the start-up prologue is included for those who wish to modify it.

Until now, the *Microsoft Windows Software Development Kit* has included an update to the C Compiler for programming Windows applications. This new C Compiler supersedes that interim release and also includes updated libraries for Windows applications. However, Windows program-mers will need the *Software Development Kit* for some utility programs, header files, the LINK4 linker, and the reference documentation.

Full-Screen Debugger

The most significant addition to Version 4.0 is a new full-screen debugger, called Code-View. If SYMDEB (included with the Microsoft Macro Assembler) is a symbolic debugger with a superset of DEBUG commands, CodeView is like a full-screen SYMDEB with several added features.

The CodeView screen can use a second monitor and can work in the EGA's 43-line mode. On a single-monitor system, it can switch between your program output and the Code-View display by swapping screen buffers or switching pages.

CodeView opens up to four windows, the first of which shows a command-line interface much like SYMDEB's. The "register" window lets you see all registers and flags, and a "watch" window lets you observe variables or expressions written with C syntax.

The fourth window shows your source code, either by itself or in a combined assembly language and source code display. The assembly language listing identifies all functions and variable names and even local variables—information that is normally lost when a program is compiled.

Command-Line Options

To do this magic, command-line options on the compilation and link steps cause all line number, function, and variable information to be embedded in the .OBJ and .EXE files. Although the full features of Code-View can thus be used only with output from the C Compiler, Version 4.0, Microsoft will also be upgrading its other language products to take advantage of CodeView.

The new CodeView debugger displays C source code and compiled assembly language with symbolic names (including local variables) substituted for memory addresses.

The EasyMail data files can be merged into *Easy* form letters the same way *WordStar* does with *MailMerge*.

Ever start writing a budget proposal and remember you wanted to drop in some figures you created with *1-2-3* or *Symphony*? As with most word processors, you can insert another file into the one on which you're working. *Easy* goes one step further and recognizes any file with the extension .WKS or .WK1 as a Lotus spreadsheet; you can insert the whole file or a named range.

As in the previous version, *Easy* works with only three keys: F1 (help), F2 (for alternating editing menus), and Esc (to back out of anything you didn't intend). That's easier for casual and first-time users, but a drawback once you're trying to build up speed.

Printer features such as double-width or near-letter-quality dot matrix characters can be used with the editing menu.

Easy, Version 1.5, could use the Chrysler advertising line: "The competition's good—we had to be better." Except in *Easy*'s case, it's a crowded marketplace with old reliables getting stronger and talented young upstarts looking for action.

■ NEW ON THE MARKET ■ PAUL M. STAFFORD

PC Convertible Add-Ons Expand RAM, Disk Storage Capabilities

As aftermarket products for IBM's $1,995 PC Convertible are beginning to trickle onto the market, two companies announced products that enhance the Convertible's usefulness both as a desktop and a portable machine.

STB Systems' $450 C-Ram 384 is a single 384K-byte CMOS RAM card for the PC Convertible that brings the unit up to a full 640K RAM. IBM offers the PC Convertible with 256K standard, with two slots for IBM's $195 128K cards, which totals only 512K.

Alloy Computer Products' $1,995 Starbase II is an add-on subsystem that connects a 5¼-

Lotus Invades Micro-Mainframe Market: The Application Connection

Lotus Development Corp. broadened its horizons with a series of software packages designed to enhance data sharing between PCs and mainframe computers.

The Application Connection (TAC) line is PC and mainframe software that connects statistical packages and so-called "fourth-generation" databases on IBM 370, IBM 43xx, and IBM 30xx mainframes running the VM and MVS operating systems with PC-based spreadsheet and database applications. On the mainframe end, VM/TAC ($10,000) or MVS/TAC ($13,000) interfaces with PC/TAC ($180) to transfer and translate data from one side into data usable by the other. Also available are separate modules that translate specific mainframe applications formats, such as RAMIS II and NOMAD2.

List Price: VM/TAC, $10,000; MVS/TAC, $13,000; PC/TAC, $180.

Requires: 192K RAM. Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; (617) 577-8500.

CIRCLE 431 ON READER SERVICE CARD

inch floppy disk drive, a 20-megabyte hard disk, and a parallel port to the PC Convertible. The $2,495 Starbase III adds a 40-megabyte tape-backup unit into the equation.

List Price: C-Ram 384, $450. STB Systems Inc., 601 N. Glennville, #125, Richardson, TX 75081; (214) 234-8750.

CIRCLE 432 ON READER SERVICE CARD

HOT PROSPECT

Software Publishing, Software Products Int'l Introduce Integrated Packages

Two companies' integrated software packages offer extensive features to new categories of users.

Software Publishing Corp., in its first new product announcement since *Harvard Presentation Graphics*, has released *PFS:First Choice*, an entry-level package that includes word processing (with a spelling checker), spreadsheet, database, and communications modules for $149.

In a related announcement, Software Publishing introduced the *PFS:Professional Series*. The new series will replace the old PFS line (which, incidentally, is still available for now) and will include *PFS:Professional File* ($249), *PFS:Professional Write* ($249), and *PFS:Plan* ($249).

Software Products International's $595 *Open Access II* integrates six modules: a relational database, a

spreadsheet (with a minicalc with 3-D graphics), word processing, communications, and a full set of desktop utilities, including a Rolodex file with auto-dialer, calculator, calendar, and appointment scheduler.

List Price: *PFS:First Choice*, $149; *PFS:Professional File*, $249; *PFS:Write*, $249; *PFS:Plan*, $249.

Requires: *PFS:First Choice* and *Professional File*, 256K RAM; *Professional Plan*, 384K RAM; *Professional Write*, 320K RAM. Software Publishing Corp., 1901 Landings Dr., Mountain View, CA 94043; (415) 962-8910.

CIRCLE 429 ON READER SERVICE CARD

List Price: *Open Access II*, $595. Requires: 256K RAM. Software Products International, 10240 Sorrento Valley Rd., San Diego, CA 92121; (619) 450-1526.

CIRCLE 430 ON READER SERVICE CARD

Software Publishing Co.'s *First Choice* is a $149 integrated software package that features word processing, database, spreadsheet, and communications modules.

STB Systems' $450 C-RAM 384 adds in to the IBM Convertible PC to give it a total of 640K bytes of RAM.

List Price: Starbase II, $1,995; Starbase III, $2,495. Alloy Computer Products Inc., 100 Pennsylvania Ave., Framingham, MA 01701; (617) 875-6100.

CIRCLE 433 ON READER SERVICE CARD

IBM Debuts Non-EMS-Compatible Extended RAM Card, 2,400-bps Modems

IBM's answer to the problem of adding extended memory to ATs has finally arrived. It's called the .5 to 3 MB Memory Expansion Adapter (MEA), and it costs $595 with 512K bytes of RAM ($165 apiece for additional 512K modules). The MEA is not compatible with the Lo-

Toshiba Offers Low-Priced 24-Pin Dot Matrix Printer; Epson Ships 9-Pin, 24-Pin Units

Two major players in the dot matrix printer market have upgraded their offerings.

Toshiba America's $999 P341e is a 24-pin, 136-column printer that operates at claimed print speeds of 216 characters per second in draft mode and 72 cps in correspondence-quality mode. The P341e has a parallel/serial interface and uses both bidirectional-tractor and single-sheet-feed mechanisms.

Epson America continues its assault on the market with two 136-column units: the 9-pin $995 EX-1000 and the 24-pin $1,595 LQ-2500. Epson claims print speeds of 300 cps in draft mode and 60 cps in near-letter-quality mode for the EX-1000,

tus/Intel/Microsoft expanded memory specification, but it is TopView, Version 1.1, compatible; the card's memory can also be used to backfill conventional RAM up to DOS's 640K limit.

Also new are True Blue are two 2,400-bit-per-second modems: the internal Model 4829 ($569) and the external Model 5842 ($719). Both devices are compatible with the Hayes "AT" command set and with IBM's proprietary command set. Both also use adaptive line-equalization techniques that reduce data-reception errors by automatically compensating for line-quality fluctuations.

List Price: 3 to 3 MB Memory Expansion Adapter, $595; 512K add-on modules, $165; Model 4829, $569; Model 5842, $719. Call or write your local IBM representative.

CIRCLE 445 ON READER SERVICE CARD

Vericomp, Boca Research Debut Low-Cost LIM Expanded Memory Cards

Two companies have debuted inexpensive expanded RAM cards that adhere to the Lotus/Intel/Microsoft expanded memory speci-

fication (EMS). Neither contains I/O ports or can "backfill" RAM up to 640K.

Vericomp's Breakthru/PC costs $150 with 0K bytes of RAM and $398 with a full 2 megabytes on-board. Vericomp claims that its card bank switches 15 percent faster than Intel's Above Board and over 25 percent faster than AST's LIM-page!

Boca Research sells its BO-CARAM to dealers only with 0K bytes of RAM for $198 and to the public for $245 with 256K bytes, $395 with 1 megabyte, and $740 with 2 megabytes. RAMdisk software provided with the card permits warm booting without loss of contents.

List Price: Breakthru/PC with 0K bytes of RAM, $150; with 2 megabytes, $398. Vericomp, 8825 Aero Dr., #210, San Diego, CA 92123; (619) 227-0400.

CIRCLE 440 ON READER SERVICE CARD

List Price: BOCARAM with 0K RAM, $198; with 256K, $245; with 1 megabyte, $395; with 2 megabytes, $740. Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33431; (305) 997-6227.

CIRCLE 441 ON READER SERVICE CARD

Hewlett-Packard Eight-Pen Plotter Designed for Low-End CAD Market

Hewlett-Packard Co. has unveiled its $5,400 HP Draftpro, an eight-pen plotter that accepts up to D-size (640- by 1,000-millimeter) paper. The unit features automatic pen-changing and capping, and HP claims 15-inch-per-second pen speed, .001-inch addressable resolution, and .2 percent linear accuracy. The HP Draftpro also features pen sorting, which lets it draw a full buffer of vectors in one color before drawing the next.

List Price: HP Draftpro, $5,400. Hewlett-Packard Co., 3000 Hanover St., Palo Alto, CA 94304; call the Hewlett-Packard sales office listed in your white pages.

CIRCLE 434 ON READER SERVICE CARD

Hewlett-Packard's $5,400 HP Draftpro is an eight-pen plotter capable of 15-inch-per-second pen speed, .001-inch addressable resolution, and .2 percent linear accuracy.

and speeds of 324 cps in draft mode and 108 cps in NLQ mode for the LQ-2500. Both printers feature 8K-byte buffers and front-panel controls, which eliminate the need for DIP switches.

List Price: P341e, $999. Toshiba America Inc., Information Systems

Toshiba America's $999 P341e is a 136-column, 24-pin dot-matrix printer that Toshiba claims will print 216 characters per second in draft mode and 72 cps in NLQ mode.

Div., 2441 Michelle Dr., Tustin, CA 92680; (714) 730-5000.

CIRCLE 436 ON READER SERVICE CARD

List Price: EX-1000, $995; LQ-2500, $1,595. Epson America Inc., 2780 Lomita Blvd., Torrance, CA 90505; (800) 421-5426 (outside Calif.); (213) 539-9140.

CIRCLE 435 ON READER SERVICE CARD

Epson America's $1,595 LQ-2500 is a 136-column, 24-pin dot-matrix printer that operates a claimed print speeds of 324 characters per second in draft mode and 108 cps in NLQ mode.

LANs: Univation, 3Com, Debut Network Systems Based on IBM Token Ring

As the networking market heats up, two makers have introduced local area network products that link to IBM's Token Ring Network.

Univation's LANscape network is an Ethernet-based system that uses Novell's Advanced NetWare 2.0 operating system and can emulate IBM's NETBIOS standard. The system is centered on the $5,495 FS 2000 File Server, which features a 10-MHz processor and up to 1,200 megabytes of mass storage, and can support up to 100 workstations through the $595 NC 516 Network Interface Card.

3Com Corp. offers a series of Token Ring–compatible products, all based around the company's popular 3Server ($8,995).

The TokenLink Plus adapter card sells for $1,095; the Token Connection for the 3Server is $1,295. RingTap ($95) and TokenPlus (of various lengths; starting at $50 for 5-meter lengths) provide a cabling solution based on the Token Ring and Ethernet standards.

List Price: FS 2000 File Server, $5,495; NC 516 Network Interface Card, $595. Univation, 1231 California Circle, Milpitas, CA 95035; (408) 263-1200.

CIRCLE 442 ON READER SERVICE CARD

List Price: TokenLink Plus, $1,095; Token Connection, $1,295; RingTap, $95; TokenPlus, starting at $50. 3Com Corp., 1365 Shorebird Way, Mountain View, CA 94039; (415) 961-9602.

CIRCLE 443 ON READER SERVICE CARD

Univation's $5,495 FS 2000 File Server is the center of its LANscape network, which uses Novell's Advanced NetWare 2.0 operating system and can emulate IBM's NETBIOS Token Ring standard.

Adaptec Controller Boosts Hard Disk Capacity by 50%

PC HANDS ON

BY WINN L. ROSCH

The cost of hard disk storage may take another big drop, but this time it's the result of American ingenuity rather than Asian factory efficiency. Previous hard disk price decreases were directly attributable to the influx of cheap hardware from the Far East, but a new PC-compatible hard disk controller from Adaptec of Milpitas, Calif., will let users squeeze 50 percent more data onto many existing hard disks.

Increases Storage

With the Adaptec ACB-2070A Hard Disk Controller, the mass storage capacity of many systems can be boosted as easily as plugging in the new card—for instance, a 20-megabyte drive can be stretched to 30 megabytes.

The secret of the Adaptec ACB-2070A is that it uses 2,7 RLL (Run Length Limited) data coding, while nearly all other PC hard disk controllers use MFM (modified frequency modulation). The essence of this difference is the pattern of magnetic transitions that actually store data on the disk: 2,7 RLL requires 50 percent transitions (which means 50 percent less disk space) to encode the same amount of data as MFM.

Boost Transfer Speed

Another benefit of the new ACB-2070A controller is speed. The 2,7 RLL coding increases the data transfer rate of the disk subsystem from 5 MHz to 7.5 MHz. In addition, the ACB-2070A controller uses a sector interleave factor of 3 (versus the XT's 6), which also quickens data transfer.

Even if you're not experienced in programming, you can

adapt the ACB-2070A to your system. The necessary disk formatting and system configuring software is recorded in ROM on the controller, and it can be put to work using DOS's DEBUG.

Easy Installation

The controller is so PC compatible that you could slide the ACB-2070A into any full-length slot in your XT and, with no more than a few minutes' tinkering, add 50 percent to the capacity of your hard disk—except the ACB-2070A controller won't work with IBM factory-installed hard disks. The disks are not capable of meeting the rigorous demands made by the 2,7 RLL coding.

"Not too many drives currently support RLL," notes A. Edward Turner, Adaptec director of marketing. "It takes better media and a better read/write channel."

However, if you've bought

one of the more recent drives that will support 2,7 RLL, you can boost your disk capacity with the $154 addition.

Although the current ACB-2070A controller works with only PCs, XTs, and some compatibles, Turner promises, "We're working on one for the AT, too. It may cost a little more than the XT version, but not much."

■ PC UPDATE ■ CHARLES BERMANT AND DAVID GRAY

Pressured by the success of low-cost PC compatibles, IBM Corp. cut the prices of its floppy-disk-drive PCs by $400 on August 1. A 256K-byte PC with two 360K-byte floppy disk drives was cut 20 percent to $1,595; the one-disk-drive PC was cut 22 percent, to $1,445. A 64K no-drive PC was reduced $225, or 16 percent, from $1,390 to $1,165. Prices on PC ATs and PC-XTs were unchanged. It was the second price cut of 1986 for IBM. On April 2, prices of PCs, XTs, and ATs were cut by as much as 26 percent, including $150 and $300 on one- and two-floppy-disk PCs, respectively.

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Want to buy an IBM **PC Convertible**? Don't plan to check in with the office by electronic mail if you do. While the $1,995 laptop was introduced April 2, the $450 1,200-bit-per-second modem option won't be available until the fourth quarter, IBM says. Why the PC Convertible doing otherwise? The demand is greater than expected, IBM says; some customers may have to wait as long as 5 months.

But Bruce Grant, director of technical support for Microage

computer stores, says interest in the laptop has come from major accounts who want to evaluate the unit, rather than from individuals. "IBM has not delivered the entire product," he says. "It's coming in bits and pieces. It's not selling like hotcakes, but it may be constrained by lack of availability. The sales people can't get the units, so they might not be pushing them."

Others are more blunt: "We've had very few requests for the IBM Convertible," says Mike Collins, sales manager for ComputerLand in Lubbock, Tex. "The laptop doing the best is the **Toshiba T1100 Plus**; it's faster and less expensive than the IBM. There has been little or no interest in the Convertible."

          *   *   *   *

Lotus Development Corp. released *1-2-3*, Release 2.01. The upgrade, characterized as a maintenance release, corrects incompatibility problems with label treatment between Release 2 and Release 2.01. Previously, the use of dashes for 0s in labels in a Release 1A worksheet template resulted in error messages with Release 2.01. With Release 2.01, dashes used in a mixed formula reference now are treated as 0s. In addition, Release 2.01 speeds up the file retrieval time and provides for simpler installation. The program remains copy protected. Upgrades from Release 1 or 1A are $150; upgrades from Release 2 are $15. Without an upgrade, the program remains $495.

          *   *   *   *

The Consortium, a Los Angeles–based group, has been formed with the purpose of consolidating the *1-2-3* aftermarket. Aimed at the estimated 3 million users of *1-2-3*, it will provide a number of services for both buyers and sellers of these add-on products. The company will be generating monthly *State of the Aftermarket* press releases and will conduct free seminars and user group presentations nationwide. A booklet that lists many aftermarket vendors is available from The Consortium at 10644 Eastborne Ave., #202, Los Angeles, CA 90024; (213) 470-8644.

          *   *   *   *

The National Data Corp. has introduced a PC version of *Probe*, its decision support system. In its mainframe form, *Probe* has been used for market and sales forecasting and economic analysis in several large corporations. The PC version has incorporated program-

ming and modeling modules with the ability to create statistical models. It's available for $1,600 from National Data Corp., Corporate Sq., Atlanta, GA 30329; (404) 329-8500.

          *   *   *   *

Generic Software has added *AutoDimension*, an automatic dimensioning module, to its $99.95 *Generic CADD* package. *AutoDimension* adds dimensions and legends to computer-generated drawings. It can be ordered for $49.95 from Generic Software Inc., 8763 148th Ave. NE, Redmond, WA 98052; (206) 885-5307.

          *   *   *   *

MBBS Software has released Version 3.1 of *Merge n' Print*, a product that gives word processors easy access to database files for the preparation of personal form letters and related functions. The program serves as a mail-merge bridge, eliminates the full conversion incompatibilities, and supports print-formatting commands. The cost is $100 from MBS Software, 12729 NE Hassalo St., Portland, OR 97230; (503) 256-0130.

          *   *   *   *

Direc-Tree, a hard disk file-management program, has been upgraded to Version 5.0. Copy protection has been removed from the program, which is now called *Direc-Tree Plus*. In addition, short notes on file directories can be implemented, and subdirectories can be hidden and accessed only through a password. You can purchase it for $49.50 from Micro-Z Co., P.O. Box 2426, Rolling Hills, CA 90274; (213) 377-1640.

          *   *   *   *

GOLDATAbase, a database management program, has been reduced in price to $124.95 from $595. In addition, a 20 percent discount is being offered through October 1, bringing the cost of the package down to around $100. Contact: Goldata Computer Services, 2 Bryn Mawr Ave., Bryn Mawr, PA 19180; (215) 525-1036.

          *   *   *   *

Borland International upgraded *Turbo Tutor* to Version 2.0, the price increases by $5, to $39.95, with upgrades available for $10; Borland also introduced an enhanced version of *Turbo Lightning*, now called Version 1.02A; the upgraded program retains the $99.95 price and now supports possessives and the *dBASE III* and *Enable* environments. Users who want to upgrade to 1.02A must return their disk to Borland and pay $15.

          *   *   *   *

Autodesk has enhanced *AutoCAD 2.5*. Added features include such new editing commands as Stretch Trim, Rotate, Scale, and Explode; faster span and zoom operations; support for Lotus/Intel/Microsoft expanded memory or PC AT extended memory; and a hardware-based copy-protection scheme. Also released were *Auto-CAD AEC Architectural*, Version 2.5—an architectural design and drafting package for use with AutoCAD (it lists for $1,000, with free upgrades for *AutoCAD AEC* users)—and a $2,750 version of *Auto-CAD*, Version 2.5, for the IBM RT PC. The normal Version 2.5 also lists for $2,750, with upgrades available for the difference in retail price between it and previous versions.

AutoCad 2.5 has expanded memory and faster zoom

Referee Blows the Whistle on Memory-Resident Programs

PC HANDS ON

BY WINN L. ROSCH

Your PC won't explode if you try to cram too many resident programs into its limited RAM, but you just might. All too soon you'll end up playing "hot key" roulette, never knowing what program will pop on the screen with each key press, and your favorite applications will shrivel and die from the lack of RAM to roam in.

Earlier this year, PopDrop ($19.95) from InfoStructures of Tucson, Ariz., made managing resident utilities easier by letting you slide the programs out of memory when you no longer need them (see PC News, page 46, "PopDrop Removes Resident Programs from PC Memory," PC Magazine, Volume 5 Number 11). Now Persoft's Referee takes memory-resident program management one step further: it lets you eliminate

RAM-resident software or just temporarily disable individual resident programs to keep them out of the way and then reactivate them when you need them.

Refwatch Memory Monitor

To bring Referee into the field, you load Refwatch, a RAM-resident requires 25K bytes) memory monitor, which tracks each change of the host system's interrupt vectors and memory assignments. Once Refwatch is in place, you can load your other memory-resident programs.

You have two options for handling resident programs: Referee, a disk-loaded utility, or Sideline, a pop-up memory-resident version (which requires 15K bytes, plus an additional 12K if you want it to pop up over graphics screens). Both are menu oriented and easy to use.

Both programs let you peel other RAM-resident programs from memory one layer at a

time—the last to be loaded must be the first to go. You can also suspend the operation of any or all of the programs that are resident—in any order—without unloading then from memory, so that pressing hot keys won't pop up the programs. Both Sideline and Referee also monitor memory usage and tell you which programs are resident at any given time.

Go the Extra Mile

Referee goes even further, allowing you to designate particular resident utilities to function with particular programs. Then, when the designated program runs, only those resident utilities associated with it will be automatically activated, while the rest are put on hold.

This technique has its shortcomings. When Referee suspends a resident program, the program does not drop from memory but waits to be recalled. Your RAM is left

crammed even though the space-hogging resident programs aren't doing anything for you. Fortunately, Referee also has a command mode, which allows you to use it in batch files and throw resident programs completely out of memory.

Within its limitations (and those of DOS), Referee gives you more control over resident software than any other product currently available. ▨

PC FACT FILE

Referee
Persoft Inc.
465 Science Dr.
Madison, WI 53711-9380
(608) 273-6000
List Price: $69.95
Requires: 64K RAM for main program, one disk drive, DOS 2.0 or later.
In Short: A memory manager that can either remove RAM-resident programs from memory or temporarily disable unused programs (without unloading them) to prevent "hot key" conflicts. Not copy protected.
CIRCLE 420 ON READER SERVICE CARD

V-EMM: Virtual Disk for EMS Memory

PC HANDS ON

BY WINN L. ROSCH

Mainframe computers have long used the technique of virtual memory to make cheap disk memory act like expensive RAM. Virtual Expanded Memory Manager (V-EMM) by Fort's Software brings this capability to personal computers.

This $89.95 program turns up to 8 megabytes of hard disk storage into virtual RAM accessible by programs that run under the Lotus/Intel/Microsoft expanded memory specification (EMS). Using V-EMM, bytes are written to disk rather than to RAM chips and are located as needed. In addition, V-EMM

lets extended memory work as expanded memory on PC ATs and compatibles.

V-EMM can be installed only when you need it—for instance, when working with a massive 1-2-3, Release 2, spreadsheet that won't fit in normal memory. The penalty is speed—RAM is much faster than hard disks.

Extending AT Memory

V-EMM can redirect 80286 protected mode (extended memory) to the Lotus/Intel/Microsoft expanded memory specification so that PC ATs can actually use memory in excess of the 640K bytes of RAM recognized by DOS. While many of EMS programs are available, most notably 1-2-3,

there's little use for extended memory beyond RAMdisks.

On systems without EMS, V-EMM installs as a system driver in the CONFIG.SYS file of the host. In all cases, special programs are used to install, deinstall, and activate the V-EMM memory. V-EMM reserves the disk space for EMS emulation by writing a hidden, read-only file in the root directory, invisibly trimming disk capacity.

On systems that already have some EMS memory (for instance, with an Intel Above Board), V-EMM takes no space from DOS memory. PCs without EMS pick up 64K bytes of DOS memory to use V-EMM: ATs require 72K. V-EMM is almost entirely compatible with EMS, except that it cannot handle function calls that directly access EMS hardware. Most programs do not use these calls, and their use is discouraged in EMS programming guides. ▨

PC FACT FILE

Virtual Expanded Memory Manager (V-EMM), Version 2.0
Fort's Software
P.O. Box 396
Manhattan, KS 66502
(913) 537-2897
List Price: $89.95
Requires: 128K RAM, EMS board with 256K EMS memory (or 64K to 72K additional memory without an EMS board), DOS 2.0 or later.
In Short: A software product that uses hard disk memory or 80286 protected mode (extended memory) to emulate up to 8 megabytes of Lotus/Intel/Microsoft EMS RAM. Not copy protected.
CIRCLE 421 ON READER SERVICE CARD

■ COMMUNIQUES ■ EDITED BY BILL HOWARD

For the PC owner who has everything (but taste): computer "fart-ipherak." The PC Beast is $14.95 from Fundamental Design Group, 154 Magazine St., Cambridge, MA 02139; (617) 876-4141.

Trick of the Month

"*OfficeLink/WordStar* converts *WordStar* documents to *Word-Star* and vice versa while maintaining complete document integrity."

—Office Solutions press release

But Does It Convert WordStar Files?

"*URGENT!*
CORRECTION TO PRESS ANNOUNCEMENT

"The following announcement was issued on June 13,

1986, and is subject to these corrections.

"'—There was an error in the capitalization of MicroPro.

"'—The closing quotation mark was one space to the right.

"'Attached is a correct version."

—Borland International press release

Best New Names

Amnesia Board, a $99 PC ($129 for ATs) expanded memory board from Nebec of Carson City, Nev. Why do they call it Amnesia Board? It comes with no memory.

RapSheet, a small shareware spreadsheet written by Bill Grimm for blind PC users. It works with several voice synthesizers now on the market. ($35 suggested donation for IBM or Apple versions; Bill Grimm, P.O. Box 10367, Fort Wayne, IN 46852.)

Heard anything offbeat about computers—jokes, typos, odd stories, outrageous claims? Send them to Communiqués, PC Magazine, 1 Park Avenue, New York, NY 10016; (212) 503-5293 or MCI Mail 157-9301. We'll send you a PC Magazine T-shirt and $50 for each item used.

Jose, This Is Philodendron— Do You Read Me?

Jose Sanchez, a Long Beach, Calif., engineer, is using a personal computer to "accumulate data related to the generally accepted observation that there exists some form of telepathic perception, by plants, of human beings."

Sanchez says a houseplant hooked to his computer emits electrical impulses when he enters the room. With the aid of a

30K-byte program that converts the impulses to random words, the plant produces free-form verse.

War Games

Nisan Ebel, of Israel Aircraft Industries, was quoted in *The New York Times* on the Lavi (Hebrew for *lion*) fighter plane that Israel wants to build instead of buying American F-16s:

"The F-16 is a Commodore 64. The Lavi is an IBM PC with 500,000 bytes and a hard disk."

*Roses are red,
Violets are blue*

Tandy Expands Line of Low-Cost PCs, ATs

BY PAUL M. STAFFORD

NEW YORK—Tandy Corp.'s introduction of four new PC-compatible machines marks an attempt on the part of the Texas-based electronics giant to solidify its hold on the DOS-at-home market and to penetrate further into the business PC marketplace. It also shows Tandy's willingness to battle both IBM and the no-name mail-order clone manufacturers simultaneously on the basis of price.

Two of the models—the $799 1000 EX and the $1,199 1000 SX—will fit nicely into the home niche created by bu-

sinesspersons who work at home and by students. Increased acceptance of these machines has been made more likely by the discontinuation of the $999 Tandy 1000, which has so far been the main contender in that field.

The EX is primarily an educational machine, with 256K bytes of RAM, one 5¼-inch disk drive, and space for three proprietary expansion cards. It is a one-piece unit that more closely resembles the Commodore 64 than it does the IBM PC. The 1000 SX looks just like the discontinued 1000, but runs at dual speeds of 4.77 and 7.16

MHz. Both 1000 models come with *Desk Mate II* integrated software.

A pair of 80286 machines rounds out Tandy's contribution to the business end of the market. The $1,699 3000 HL, made at 4.77- and 8-MHz clock speeds, comes standard with 512K bytes of RAM (expandable to 640K), one 360K floppy disk drive, and seven expansion slots (four 8-bit and three 16-bit). The $4,299 3000 HD is a version with a 40-megabyte hard disk drive.

Compete on Price

The three machines that are really new have a chance to make a strong impact on the market. Both the 1000 EX and the 1000 SX compete aggressively with others in their class: the Leading Edge Model D retails for $1,295 with 512K bytes

of RAM, two floppy disk drives, and a monochrome monitor; the Epson Equity II sells for $1,695 without a monitor but has a dual-speed (4.77- and 7.16-MHz) CPU. A 256K, two-floppy IBM PC is $1,595.

The 3000 HL competes directly with mail-order AT compatibles such as the $1,495 PC's Limited AT. And all the Tandy machines have the advantage of being part of the country's largest computer-dealer network.

The $1,699 Tandy 3000 HL comes standard with 512K bytes of RAM.

Cell/Mate Locks Out Errors From Lotus Spreadsheets

BY IRIS KNITTEL

Have you ever wanted to check your own spreadsheets for inconsistencies and possible errors? Or received a hand-me-down worksheet and wanted to find out how the numbers were derived? Or wanted to give your boss not only a spreadsheet but a logical English-version explanation of where those numbers came from? There's a new, important program from Clarity Software Corp. that does all this and more. Called *Cell/Mate*, it works with spreadsheets produced by all versions of both *1-2-3* and *Symphony*.

There's a good reason for the existence of *Cell/Mate*: Lotus spreadsheet errors. Not only ERRs, @NAs, and circular references but also the less-obvious and more-insidious types such as formula references to empty cells, totals with nonreferenced range coordinates, cells not referenced containing constants, and so forth. *Cell/Mate's* "reports" examination mode identifies these types of trouble spots so that you can correct them. This lets you check a spreadsheet for errors *before* acting on its results.

Examination Modes

Cell/Mate has three other examination modes: document, analyze, and where-used. All three work on either a single cell, a row or column, a named range, or an entire worksheet—depending on your specifications. The document inquiry can produce an English-sentence version of a formula or series of formulas such as Entertainment [Jan] = 0.05 *TOTAL INCOME [Feb]. Or you can toggle a formula version of the same cell. In this fashion, you can document the logic behind an entire worksheet or model.

The analyze mode takes

things one step further. It first documents a cell and then analyzes each of the component parts to the right of the equal sign (=). For the example used above, it would offer additional details in the following three equations:

TOTAL INCOME [Feb] = SUM (Salary [Feb] THRU Deductions & Taxes [Feb])

Salary [Feb] = 2350

Deductions & Taxes [Feb] = −494

You can set the level of the analysis from one to ten levels.

The where-used mode is the opposite of the analyze opera-

Tornado Notes: Whirling Disparate Data into Line

BY CHRISTOPHER JOHNSTON
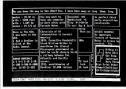
It flew in from New Jersey, whirling information into line: it's *Tornado Notes*, a RAM-resident notepad utility that sections the monitor screen into myriads of overlapping windows. These can be filled with ideas, schedules, memos, time zones for cities around the world, or the price of eggs in Zimbabwe.

Ingenious Windowing

The program writes all its notes to a single DOS file; *Tornado Notes's* windowing function divides that file into portions that appear on the screen in separate windows. These act like a stack of notes on a desktop. You rummage note by note through the stack using the cursor keys; Home and End pop to the top and bottom of the stack. Otherwise, you can search for a note by content, using *Tornado Notes's* string-search function.

A small command menu tags along wherever you go, and so the available options are always on-screen. Also, concise on-line help is an H key away.

Since *Tornado Notes* can hold up to 28 notes at a time, it's fortunate that Micro Logic included a visually oriented string-search function, which

Cell/Mate

(continued)

tion. It shows where a designated cell is used elsewhere in the spreadsheet. This can be extremely helpful for seeing which cells will be affected if a change (or an error) was made in the source cell.

User Interface

The user interface is not entirely intuitive to learn, but it's easy to use once you have some experience with the program. For the document, analyze, and where-used modes, *Cell/Mate* opens a utility window that shares the screen with your worksheet. If the utility window is too small for the information generated by your inquiry, you have the option of toggling into it and perusing the rest of the data. Or you can zoom into the utility window and display it full-screen. *Cell/Mate* also makes it easy to print out the information in the utility window.

To transcribe your spreadsheet formulas into English, *Cell/Mate* has you use the row and column headings to define the cells. There are other features that help you fine-tune the English version to be more descriptive of the cell contents, including column and row prefixes, suffixes, and repeating labels. *Cell/Mate* should work well with most, if not all, of your worksheets.

Aerial Views

Another snappy feature of *Cell/Mate* is that it produces an aerial view of your named ranges—including where they overlap. *Cell/Mate* also provides context-sensitive help screens.

1-2-3 or *Symphony* users will feel right at home with *Cell/Mate*'s screens and command menu because they mimic *1-2-3* and *Symphony* menus. Don't expect to be able to learn as you go, though. You'll have to read the documentation or take the well-written tutorial before you know your way around *Cell/Mate*. But the effort will be well worth the time because if spreadsheets are your forte, you won't mind being locked up with *Cell/Mate*. ▓

Calendar Creator Creates Better Calendars

BY M. STEPHANIE RICKS

Calendar Creator is a handy no-frills utility. Unencumbered by fancy graphics and hefty documentation, *Calendar Creator* lets you keep track of daily, monthly, and recurring events in a well-organized and accurate manner.

It achieves this simple aim through the use of overlays—similar in concept to film transparencies—which allow you to incorporate, edit, or remove specific calendar groupings. Updating calendars is easy because the overlays are such handled individually.

Calendar Creator has two convenient options: the wildcard and the floating event. The wildcard, or recurring-event, function, lets you mark recurring occasions like birthdays and anniversaries with an asterisk.

The floating-event function lets you set aside events that vary by date but occur in regular patterns such as the third Wednesday of each month or the first Sunday of each December. Using *Calendar Creator*'s wildcard and floating-event functions in tandem, you can create a calendar that marks off every Saturday in October 1986

Channelmark Corp.'s $39.95 Calendar Creator picks up where SideKick's calendar facility leaves off, letting you maintain a complicated events calendar.

and 1987.

Calendar Creator is simple to use. The main menu is divided into six program functions, which allow you to create, edit, and remove overlays; print calendars; and save and get overlay groups.

Calendar Creator does have some important limitations: It cannot spread a single event over the course of several days, so you must enter such events separately on each date. Also, when you ask the program to find events on a particular date, only the first event listed on that date is highlighted.

Overall, though, *Calendar Creator* offers timely, well-detailed, and easily updated calendars for personal and professional use. ▓

Tornado Notes

(continued)

displays a line of dots—one for each note. The string-search function eliminates notes that don't match the string criteria until finally only those notes with the typed string remain. When only one remains, the program moves immediately to that note.

Numerous Options

After bailing on a note, you can print, edit, or delete it, or you can search for or create a new note. When you make a new note, you either specify window size and screen position or let the program fit a border to

the text. The editor is simple and includes word processing standard brand features such as cut and paste, insert and delete, word wrap, and date/time insertion. The print submenu has formatting, page/line advance, top of form, text formatting, and automatic form and line feed. There is a tailorable forms generator for making memo forms, billing statements, or any often-used paging outline.

Tornado Notes is an enhancement to *SideKick*-like utilities but is not a replacement. People who juggle so many ideas that they're considering running off to the circus should find *Tornado Notes* a significant productivity tool. ▓

Data Zone's Hard Disk Card: Built for Speed

BY VINCENT PUGLIA

Data Zone's Slot-2 Turbo-Drive compares well with the bevy of hard disk drive/cards out there. It offers more utility and added features than many of its competitors at a comparable price. For $1,195, you get a pre-formatted 20-megabyte hard disk, an 8-MHz 8088-8 turbo processor, a hard install routine, a park program, and two SoftLogic Solutions programs, *Disk Optimizer* and *Double-DOS*.

Single-Slot Hard Drive

The TurboDrive differs from other hard disk cards because it uses a half-length controller card. The inch-and-a-half-wide drive sits nearly flush against the card; there is only a slight space between the drive itself and the controller's chips. As a result of this design, the controller can be slipped into the PC's or XT's first slot next to the power supply, with the drive hanging over into the empty

Data Zone's $1,195 Slot-20 TurboDrive is a 20-megabyte hard disk on a card that fits into a single expansion slot and features a 32-second average access time.

area behind the floppy drive.

Installation also requires that you connect an enclosed Y-adapter cable between the drive, the power supply, and one of the floppy drives. On an XT you'll have to remove the IBM hard disk controller card and run the XT drive off Data Zone's controller. Because the Data Zone drive consumes less than 10 watts, it has no trouble with the standard PC 92-watt power supply. I tested the drive in a fully populated IBM PC with no problems.

Fast Accelerator

The 8088-8 processor is rated at 8-MHz versus the standard PC 4.77-MHz chip. Replacing your PC's 8088 CPU with the 8088-8 resulted in a 10 percent speed improvement in PC Magazine Labs benchmark tests. This, coupled with the 32-second average access time of the drive itself, creates a noticeable increase in your PC's working speed.

While the two bundled pro-

grams, both of which are copy protected, are pretty good, they do not in themselves constitute a reason to buy the Slot-20 Turbo-Drive. The best reasons for liking this drive are speed, size, and value.

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Maspeth, NY 11378. 718-458-5700.

Requires an IBM PC, XT, AT or true compatible, 256K.

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CIRCLE 530 ON READER SERVICE CARD

■ **FROM THE EDITOR'S SCREEN** ■ BILL MACHRONE

PROGRESS REPORT

Understanding new technology is like learning how to swim: you don't learn by watching; you have to jump into the deep end and get wet.

Every once in a while, I practice what I preach. Several issues back, I exhorted you not to be too reliant on your old faithful hardware and software, to try out new products. You might be pleasantly surprised, said I. So I gave myself several doses of my own medicine.

My first story started a long time ago (for the computer industry) and has a happy ending. It started in Las Vegas, Nevada, November 1985, at Fall Comdex. Executive editor Paul Somerson, publisher Bill Lohse, and I were previewing a new graphics program. The then-unnamed product did only one thing but did it extraordinarily well: three-dimensional graphics. One of the principals showed how it could display data in three axes, and the three axes could be rotated, stretched, or compressed. It had an incredible array of graphic styles and formats and allowed complete customization of its graphs, too.

They finally shipped the product late in May, and I confess that I did the readers of *PC Magazine* a partial disservice. I let an issue or two slip by before I told you how great the product is.

It's called *Perspective*, and it is the best thing I've seen yet for graphically displaying complex information. I'm particularly close to that challenge because of the complex array of test results produced by PC Magazine Labs. When you're comparing products, sometimes you want to look at a product's performance across all the tests and other times you need to see how a product compares test by test.

So when *Perspective* came in, technical art director Gerard Kunkel and I immediately put it to work designing the next generation of PC Labs benchmark test charts. Then I got around to reviewing it. You can judge Kunkel's handiwork for yourself in the article on accelerator boards in our previous issue (see "Accelerator Boards: Power for a Price," *PC Magazine*, Volume 5 Number 15), and you can read my review of *Perspective* in the First Looks section of that issue.

AS YOU LIKE IT Three-dimensional graphs compress an amazing amount of data into a very small space, but power has its price. One price you pay is the ability to pick off data points accurately. Another is that low-lying points can be obscured by higher ones. *Perspective* solves much of the latter problem by allowing you to tilt and rotate the chart until all points are clearly visible.

But most 3-D graphs would be rendered unreadable by including the numbers on

the bars, as we do with simple bar graphs. Kunkel's solution, color-keyed access to the numeric table that generated the graph, is an unqualified success. It has something for everybody: Left-brained words-and-numbers types have all the facts, right down to the decimal points. Those of you who live in the right hemisphere, meanwhile, are free to draw impressions and get a feel for the data by looking at the overall "shape" of the results.

TRAINING THE READER During the design of our new benchmark graphics tests, I gave a visiting fireman's tour to Toby Hufman and Stan Hayes, principals in The Ad Works advertising agency in Atlanta. Hufman, who's from the design side, was awed by Kunkel's office, with its three computers and five monitors.

He waved at Kunkel's drafting table, clearly subordinated by all the hardware. "I used to be fond of saying that the designer's tools hadn't changed in 500 years," he said. "Now it's time for something new." Hufman looked at our design for the new benchmark tests. He was impressed. I told him of my concern that the format might be too complicated. He replied that we were training readers to understand ever-more-complex data. He gestured at our charts. "Ten years ago, no one would have understood what you were doing. Today they take it in stride."

WORD WARS I'm always ready for a better word processing program. Over the years, I've spent a bundle willingly, even eagerly. I've spent a lot of time looking at

■ FROM THE EDITOR'S SCREEN

new products, trying to understand why people are excited about them. *WordPerfect, PC Write, MindReader, Microsoft Word.* Come on, come all. You can have a piece of my life.

The only thing I ask in return is some consideration. I've been function-keyed by *MultiMate*, second-guessed by *MindReader*, and seduced by *Word*. This most recent affair of the heart hurts the most be-

cause there is so much that I like about *Word.* It is doubtless the most powerful print-formatting program, and it does the best tables of contents and indexes (though not easily). It has this great concept called style sheets. But the functions assigned to each major menu item seem arbitrary at best. For instance, you display "invisible" characters, such as spaces, from the Options menu. But you display other invisible items such as style tags from the Window menu. The Gallery menu doesn't necessarily show you your current style sheet. You have to override the default style sheet from the Format menu.

Why isn't there a built-in macro processor? Why does *Word* violate all of Microsoft's DOS rules? Why does it have the best disk-based tutorial I've ever seen yet no way to window it onto the screen next to (instead of overlaying) your working text? Despite the tutorial, *Word* is a complex program that takes time and care to learn.

Sometimes, though, the ends justify the means. I recently had an application in which the most important factor was the ease of producing highly formatted, camera-ready output from a laser printer. The typists had little or no computer experience. I looked at the alternatives; it was no contest. *Word* won. I taught them what they had to know (entering text, moving the cursor, invoking styles from the style sheet, and saving the file) in half an hour.

Of course, they didn't know about the five successive evenings that I spent cursing at *Word* and its obtuse aspects, trying to make it foolproof for them, learning enough so I could teach it effectively.

All in all, I have mixed feelings about *Word.* Microsoft is positioning it as a corporate word processor in addition to its strong presence as a professional word processor. While it has the requisite ingredients, such as exporting and importing Document Content Architecture files, excellent training, and spelling checking, it's too clunky and slow for my taste. I can't really say that *DisplayWrite 3* and *MultiMate* are better, but we'll see what the corporate market has to say.

Despite my travails with *Word,* I feel good about it and the effort I've put into it. I almost feel guilty about *Perspective* because it's allowed me to be so productive with almost no effort. That's progress. 🖅

■ JOHN C. DVORAK

CASD, COMING SOON TO A PROGRAMMER NEAR YOU

Hardware development has taken giant steps ahead of software, thanks in large part to CAD software. Now it's software's turn to shine, by letting the computer do the programming.

Designing software quickly enough to keep up with the newest hardware has always been a problem. The problem got worse when hardware development was largely automated and enhanced by computer-aided design (CAD) software.

Software, like a traitor to its own kind, made it faster and easier to develop hardware. Now the most complex hardware designs can be prototyped faster than you can say, "You still use that *old* stuff?"

The newest software for hardware development lets you design circuits, boards, and chips on the fly. One company makes a machine that can, like a photocopier, grind out prototype VLSI (very large scale integration) chips for instant use. Yet, we can't get a new word processor, and *1-2-3* is the last great software package. In other words, software is a laggard.

This just proves to me that all that hardware, and not software, drives the market, contrary to the old adage. Software is always trying to keep up with the latest in hardware development. This has to change.

SELF-PROGRAMMING SOFTWARE

It may change soon if a new generation of software evolves—the true self-programming compiler, or SPC, system. You can call these things icon-based program generators (IBFG), iconized flowchart compilers (IFCC), or whatever. The first one of any consequence will be released by Apple for its Macintosh. (By the way, this product is a big secret. Don't tell anyone!) Once the idea takes root, it will grow like a weed in a field of fertilizer.

The concept stems from some early games. The *Pinball Construction* set from Bill Budge is probably the root idea for the Apple product.

Game construction sets are a thing of beauty. You simply move icons around the screen, attach attributes, and play. Bill Atkinson of *MacPaint* fame used Budge's ideas to make a programming language that works like a game construction set.

Think about it: all the best programs start off as flowcharts and are then coded by programmers. Let's skip the middleman. Let's simply use the flowchart icons, string them together, hit the button, and let the computer do the coding!

Since there are stock programming conventions and "most efficient" techniques for actual coding work (when done by the best of the best programmers), there is no reason a computer can't code the program from a flowchart. Loops will be structured in a particular, efficient way. Data input
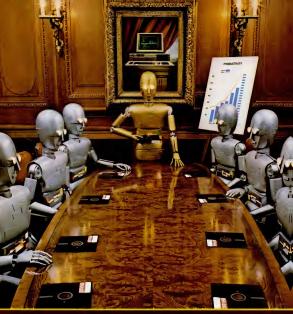
routines will be handled in the most efficient manner by the compiler. All the modern programmer will have to do is move a bunch of icons around on the screen just like a hardware designer moves chips around on his CAD machine.

This is CASD (computer-aided software development). The program-construction-set concept will speed up development of business software like we've never seen. It will allow easy development of customized vertical applications, too.

VERTICAL APPLICATIONS The pie-in-the-sky vertical-applications software market has always been hobbled by the fact that within any industry group, each company does things its own way to such an extent that no generalized vertical application is remotely acceptable. So vertical-applications software has never rocketed to glory as anticipated. CASD will change all that and revitalize the custom programming house—and maybe even make it possible for it to make money.

Just imagine moving flowchart icons around to create a program. The best of these compilers will compile directly into tight and speedy machine code. Customization of the construction set will be possible with the "program construction set construction set," which will allow you to develop a construction set to your liking. Then there will be a "construction set construction set construction set." Not a bad idea. Finally, look for an "ultimate construction set." Hmm, that will probably be called an assembler.

Some things never go away.

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THE GOLD STANDARD

INSIDE TRACK

An ugly IBM rumor reemerges. Will it change the mask of the 80286 chip? The plot thickens.

Well, well, well, the rumor that IBM is going to change the mask of the 80286 has surfaced again. IBM, as many of you know, has the masking rights to the Intel 80286 chip. This means that IBM can, if it desires, change some aspect of the chip to make it **incompatible** with other 80286 chips and therefore cut off the clone makers. Clones are now said to account for 50 percent of all 80286, or AT-type, machines. This is costing IBM **millions of dollars** in lost revenue. So the thinking goes that IBM will pull a dirty trick like this to lock up the market.

Don't expect to see this ploy done with a remasked 80286 chip. It would take too long to test the chip for bugs. It's far easier and just as efficient to distribute **new proprietary ROMs** with "gotchas" in them as it is to change the CPU.

DISK DEPT. Have you ever wondered which **colored floppy disks** are the most popular? Well, I've always wondered, and so I asked a Sentinel disk salesperson. Could it be the burgundy, the purple, the pink, or the yellow disk? Wrong, wrong, wrong, and wrong. The most-popular colored disk is **gray**! A distant second is a group consisting of red, green, and blue. **Is this pathetic or what?** "A lot of manufacturers use the gray disk," I was told, "because it adds color but it doesn't offend anyone." No wonder the industry is in such doldrums. Gray disks!

Speaking of gray, the show for the gray-suited buyers, PC Expo, just finished its New York run. The show was designed for the big shots who **buy by the bushel**. There was little of interest for guys like me until I started poking

around the innards of machines. Guess what I found running **Windows** at the Microsoft booth? A soon-to-be-announced **750** by **410 high-resolution EGA-compatible card called the Deluxe VEGA** from **Video 7**. It looked great on the NEC multisync monitor (which it requires). If you don't already know it, the multisync monitor from NEC is the **hot display device**, and it's hurting the sales of other manufacturers. My contacts at Amdek claim that **multisync is a marketing gimmick** since 95 percent of them are sold with EGA cards anyway.

Long term, the monitor business is still up for grabs, and I expect **Zenith** to **grab it** and **run** when it releases its incredible **flat tension mask** (FTS) series of monitors later this year or early 1987. The FTS monitor is manufactured with an **entirely new process**, and the screen is absolutely plumb-line flat. Meanwhile, we are starting to see a slew of quasi-flat-screen monitors using **dynamic focusing** of the gun to clean up the edges. The FTS is the one to look out for. **The quality is second to none.** But I digress. Just remember **flat is "in."**

Back to the Microsoft booth at PC Expo. The company was showing its new **Mach 10 PC 80286 speed-up board**. I thought Microsoft was going to phase out of the hardware business—guess not. The board has a cute little switch to turn it on and off so you can run your PC plain or as an AT. It costs about $500, which includes **Windows** and a mouse. Incidentally, Microsoft has put the circuitry for its **mouse board onto a single chip** that it will sell to manufacturers. Look for Compaq to use it in future designs. (I've always felt that someday the mouse will be like the car cigarette lighter. You'll always have it

on hand whether you use it or not.)

Putting a complex or (in the case of the mouse interface) a simple circuit onto a single chip is the big trend today. **Hercules put its parallel interface onto a single chip** on its new Hercules Plus card. If you don't want LPT1 on the card, then you simply pull off the chip. Computer designer George Morrow always claimed that someday the chip business will be like the **jelly bean business.** "Chips will be cheaper than jelly beans," he used to say. I don't know what to call this **flood of VLSI and custom chips.** One manufacturer may have coined a term. "The semiconductor business is turning **chicken chip!**"

GENUINELY INTERESTING SOFTWARE DEPT. IBM users who are into hot-rodding their machines at high clock speeds have found that the special **Above Board** memory add-ons—which use the Lotus/Intel/Microsoft extended memory specification (EMS)—**don't work properly** at those high speeds. Everything is specified to work at a maximum rate of 8 MHz. Meanwhile, the $600 you have to pay for these isn't **chicken feed** (but perhaps it is chicken chip).
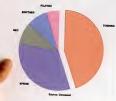
Along comes *Above Disc* from TeleWest of Irvine, California. For a mere $69.95, you can emulate the EMS standard in software using any RAM card you want. In fact, this software lets you **use virtual memory** so that your hard disk or floppy disk can **"look like" EMS RAM** to the system. Hot stuff.

These guys figure that when DOS 5.0 arrives, the 640K barrier will be gone, and so why should the budget-conscious waste money on an expensive EMS card? The EMS cards should become **collector's items one day soon.** It will go right next to my Baby Blue Z-80 card.

For now the sole distributor of *Above Disc* is hot-rodder Brian Roemmele's **Ariel Corp.**, Box 866, Flemington, NJ 08822, (201) 788-2788.

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Inverted Foldout slip-sheet

GbxSlipSheet-001

Folded edge of the page

Foldout slip-sheet

1. Open the foldout page

2. Insert this sheet with

   1. Front side touching the free page

   2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet

Free end

Slip-sheet

Front side

Fold

Inverted Back

GbsStpBack-001B

Back

1. Follow instructions on the other side

■ PETER NORTON

THE NEW PC AT BIOS: SOME SUBTLE CHANGES

With the AT's new keyboard comes a new BIOS. While this BIOS lets you install more types of hard disk drives, it is incompatible with some very widely used programs.

A recent break-in at my office (which cost us six machines, both ATs and Compaq Deskpro 286s) has taught me some valuable lessons. It also gave me an opportunity to rethink my choice of the best available PCs and to explore IBM's newest changes in the PC family—particularly the new-style keyboard.

THE IMPORTANCE OF BACKUP One of the lessons that any disaster drives home is the value of backing everything up. Luckily, we had had the foresight to equip every PC with a tape backup unit and to put a full set of tapes in our bank's safety deposit box at least once a week. Such prudence saved us a lot of grief. (Never mind that the backup tape for my own PC was bad, and that another tape required delicate repair work. That's just a dash of spice in the dish of life.)

A CHANGE OF HEART One of the advantages of losing everything is that you can start afresh; the disaster allowed us to rethink our choice of PCs. Not long ago I mentioned in this column (Volume 5 Number 8) that I was settling on the Compaq Deskpro 286 as a quasi-standard for our office machines because the Compaq had a built-in tape backup, came with an 8-MHz speed (although just about everybody with a 6-MHz AT was souping it up to 8, including me), and had that nifty dual-mode display (good monochrome characters and CGA-style graphics). In addition, we were (justifiably) concerned about the reliability of the hard disk drives

IBM had been putting into its ATs.

My experience with the Compaq since then, however, has made me reconsider that opinion. For one thing, we had enough reliability problems with the Compaqs (particularly their power supplies) to consider them no better (or worse) than the IBMs. The CGA-style graphics weren't up to snuff for serious, full-time use with programs such as *Microsoft Word* or *Ashton-Tate's Framework*; for that we needed to use the Hercules Graphics Card. The biggest disappointment, though, was the Compaq's tape drive: too small (only 10 megabytes), too slow, and too noisy to be taken seriously as a backup medium.

So, we decided to go back to the good ol' 8-MHz AT. We equipped our ATs with Hercules cards for good graphics and 20- or 60-megabyte streaming tapes for backup (we use the Maynard MaynStream, but there are other good alternatives, such as Tecmar's).

THE AT'S SUBTLE CHANGES In the process of buying these new ATs, I discovered some subtle changes in the PC family—most notably, that weird-and-wonderful keyboard that's become the new standard for the IBM family (and, I gather, for others as well).

As you probably know, IBM's new keyboard is very different from the old one. The two biggest changes are in the function and cursor keys. The keyboard now has 12 rather than 10 function keys, and the two columns of keys on the left side have become a single row of keys along the top. In addition, a separate numeric keypad and cursor set have replaced the keypad that combined these functions.

These changes in the keyboard affect more things than you might imagine. Because there are many more keys (including two Cursor Up keys), the details of how the keyboard talks to the computer and some subtle workings of the computer's internal control software, the BIOS, have had to be changed. And these changes have caused some very interesting problems.

COMPATIBILITY PROBLEMS The new keyboard is standard; consequently, it's on any machine that comes with the new BIOS. But for now—and probably just for a limited time—you can choose between the new and the old keyboard. Unfortunately, no matter which keyboard you choose, the new BIOS can cause software grief. And you can't always tell which BIOS version you have by looking at the keyboard.

■ **PETER NORTON**

Luckily, there is another way to determine which BIOS you have: check the date marking stored in memory. On XTs the BIOS is dated 01/10/86 or later; on ATs it's 11/15/85 or later.

(You can easily and quickly find the date of the BIOS in your PC by firing up DEBUG and giving it the command

    D FFFF:5 L 8

Follow that with the command Q to get back to DOS. All IBM machines, and some other brands, have the BIOS date recorded where this command finds it.)

The problems with the BIOS for the new keyboard stem from the fact that some programs "cheat," that is, work more intimately with the computer's hardware than they should. The more remotely a program interacts with the hardware, the less likely

> ■ In buying new ATs, I discovered subtle changes in the PC family—most notably a weird and wonderful keyboard.

it is to be disturbed by changes in the hardware design; conversely, the more intimate the interaction, the more likely problems become. This has been well known for a long time. But plenty of important PC programs have long been or broken these unofficial rules.

For the most part, IBM and PC-clone makers (beginning with the highly respected Compaq) have gone to great lengths to avoid making life difficult for existing software. In the case of the PCjr, for instance, IBM made an enormous and admirable effort to ensure that lots of weird PC programs would run on it.

But in the case of this new keyboard BIOS, IBM neglected software compatibility for some *very* widely used programs, notably *Framework* and the two keyboard enhancers *ProKey* and *SuperKey*. (In my tests, *SuperKey* died completely with the new machines while, to their credit, *Pro-Key* and *Framework* experienced only minor problems.) This seems amazing considering how many hundreds of thousands of copies of these programs are in use.

The problem is enormous. If you are a dedicated user of one of these programs and you get the new machine (say, to expand your office or, like me, to replace an old machine), you'll find that you can't use your old software on it. That's a serious

disruption when the software is an essential working tool for you.

We can speculate that the reason the new BIOS is incompatible with so much important software is either because IBM goofed or because it wanted to show the PC community who was in charge. But whether you chalk it up to stupidity or arrogance, it's a shock to the PC user.

In the end this problem will be solved, mostly by the appearance of new versions of the programs that have no trouble with the new BIOS—perhaps even before these words make it into print. So this will be a passing storm; but in the interim, lots and lots of PC users are going to have serious trouble coping with IBM's new machines. Their inevitable frustrations won't increase consumer loyalty.

AN ADDED SURPRISE There's more in the AT's new BIOS, however, than just the new keyboard handling. I was also surprised to discover that IBM has extended the range of hard disk drives that can be installed in the AT. Originally the AT could accommodate 14 different types of hard disk drives, ranging in size from 10 megabytes to a whopping 115 megabytes; the stock was type 2, holding 21 megabytes.

■ Some exploring with an interesting BASIC program revealed that the AT's new hard disk table has 8 new drives.

When I saw that my new ATs used drive type 20, I knew that the list had expanded. A little exploring with an interesting BASIC program that I'll share with you in a future column) revealed that the new hard disk table had 8 new drives, for a total of 22. There's nothing special in the new list, but some of them look a little odd.

So you see, out of every catastrophe that strikes your computer, you gain some rewards—or at least learn something new and interesting about your PC.

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■ JIM SEYMOUR

FCC CERTIFICATION WARS, PART 2

While the FCC is correct in making PCs meet RF standards, simple equity demands that the agency also crack down on such common noisemakers as can openers and blenders.

In the last issue I looked at some of the problems arising from the increasing ambient, or background, radio frequency and electromagnetic-interference (RF/EMI) noise that is polluting the environment.

The FCC has begun a much-publicized crackdown on PC hardware vendors whose equipment doesn't meet the tough Class A (office) and tougher Class B (home) standards. In the process, both reputations and tempers have suffered, and a lot of misinformation is being tossed around.

Producing a quiet PC isn't an easy job. Part of the trick lies in intelligent electronics design—using a custom clock circuit instead of a canned design for the clock crystal, good grounding of noise-prone multilayer motherboards, and on and on—but in many cases, actually building that quiet design is even tougher.

Looking under the hood of a PC through the eyes of a noise detective is a fascinating experience. And tracking changes over the production life of a machine is intriguing.

In early IBM PC*jr*s, for example, you'll find that Big Blue applied nickel-acrylic paint to the inside of the cabinet for noise-shielding. That's a good and relatively inexpensive solution to the problem since nickel-acrylic paint costs only about $50 a gallon.

But look inside later PC*jr*s and you'll find a cabinet sprayed with silver paint, which costs $2,000 a gallon. Do you think maybe IBM had some problems producing quiet PC*jr*s and decided to throw money, in the form of a very expensive solution, at those problems?

USER SABOTAGE
No matter how much designers and makers of PCs do and spend, they can't do much about how you and I often effectively undermine their best efforts.

Probably our simplest and most common failing is not screwing in cable connectors from the monitor to the PC and from the PC to such peripherals as modems, printers, and plotters. Both logic and self-interest seem to argue for screwing down those connectors tightly so that they don't fall out.

But if your PC or printer is wedged into a corner or against a wall—making those connectors hard for you to reach—or if you tend to swap components around fairly frequently, you may well have just skipped screwing in those connections.

And, in the process, you've defeated

most of the PC makers' efforts to reduce noise, by turning those cables into antennae that radiate noise far from your desk.

In addition, users often fail to ground their equipment adequately. Do you have one of those nice expansion chassis sitting next to your PC? Did you remember to install the little metal grounding strap? Did you connect the little grounding loop on your printer cable to a good ground on the printer?

Speaking of cables, are you using high-quality shielded cables—those with full metal-braid shielding, connected securely through 360 degrees to the connectors at both ends?

Foil shielding doesn't make for good connections. While it may be OK for ordinary PCs, the higher-speed operation of AT-class machines, which produce more noise, demands braided-cable shielding. Not only is braided shielding not required by law, but unshielded cables are still widely sold.

Which leads to a fair question: if the FCC is cracking down on PC vendors, are there other things it should be looking into?

You bet. But it's not.

UNEVEN REGULATION
For one thing, there's absolutely no regulation of such spectacular generators of RF pollution as electric can openers, light dimmers, refrigerators, and blenders, among hundreds of other everyday sources. For a taste of just how intense these RF fields can be, hold a portable AM radio near an electric can opener or a blender sometime:

■ JIM SEYMOUR

you'll hear noise pollution at work.

A bigger issue by far is that the FCC is dealing with only one side of the equation: the generation of noise. Electronic devices' susceptibility to RF/EMI noise is the other side, and although the FCC has had the authority since 1983 to require lower susceptibility to noise in the radios and televisions (and yes, PCs we buy, it hasn't acted yet.

To be sure, it's better to reduce noise at the source than to inflict the costs of noise-resistance steps on the buyers of receiving devices, many of whom couldn't care less about the Joy of Computing.

A RATIONAL POLICY? But now that the FCC has begun taking such draconian steps against PC producers, wouldn't simple equity and good public policy also dictate similar action against such prolific sources of RF/EMI noise as blenders and can openers?

The amount of shielding required to protect your televison or radio from the RF/EMI noise level we now live with far exceeds the amount necessary to shield

■ No matter how much designers and makers of PCs do and spend, they can't do much about how you and I often effectively undermine their best efforts.

against the noise emitted by PCs. Shouldn't a rational public policy acknowledge this fact?

I started looking into the FCC's PC-industry crackdown because I was skeptical of the real-world importance of FCC-compliant PCs. But, in the process I became a believer and now see those FCC inspectors playing watchdog against more noise as heroes, not villains.

What I want to see next is a little action from the FCC bosses, who need to level the field and acknowledge that PCs' noise pollution is just a drop in the bucket of the RF/EMI garbage that the unregulated appliance industry is dumping on us. And instead of just complaining about RF noise from personal computers, the FCC should keep up the good work by going after the makers of the currently unregulated TV sets, radios, and hi-fis.

■ **STEPHEN MANES**

THE CURSE OF THE LOW SERIAL NUMBER

Should you buy the latest, greatest computer technology or opt for a mature, time-tested version? This is indeed a question for the gods.

A weary pilgrim could no longer bear the oppressiveness of his existence. "Exalted maker and ruler of the universe," he apostrophized, "how is it that a planet such as ours, so rich and manifestly bountiful, is yet scourged with such manifold afflictions as hatred, famine, disease, war, and Sylvester Stallone?"

As if in answer, the skies grew dark. Thunderbolts flashed on every side. To his astonishment, the pilgrim heard a lordly voice fill the air with slightly apologetic words. "What do you expect?" the voice intoned. "It's only Version 1.0."

AXIOM 1 There are no deities in my neck of the metropolis, but we've got somebody who'll pass for a sage until a real one comes along—Max, an old radio whiz, who can do everything with a soldering iron but make it play *We Are the World*. He insists he has arrived at his present state of semiretired bliss by following what he calls Axiom 1: Don't buy low serial numbers.

Words to live by, all right. No matter what you're buying, software or hardware, if it's new, it will almost work. Almost. In the computer world, as opponents of the goofy Star Wars schemes have astutely pointed out, getting things absolutely right the first time is neither expected, demanded, nor likely.

In marketing circles the purchasers of the hottest new technologies are known as "pioneers." In computer circles they're "unpaid beta testers." In layman's circles they're "guinea pigs." But it doesn't seem

to matter what you buy, new tech or modified old-hat: buy it early and the bugs are guaranteed to bite. Purchasing a brand-new product gives you a golden opportunity to develop an intimate relationship with support personnel.

There's no need to enumerate. If you haven't run into problems, you're Gladstone Gander, the World's Luckiest Duck. Or you've sensibly come late to the party, when there's somebody around to warn you about the rancid chips.

DECORATIVE PAPERWEIGHTS Unfortunately, in a world moving as fast as this one, adhering to Axiom 1 presents real problems. Buy early and, no doubt about it, you will pay the considerable price of pioneering. But wait until a product is mature and, dollars to donuts, a newer and seductive but untested high-performance, low-serial competitor will be out there giving you come-hither looks.

Even when a new product works, you know you'll get stung when the inevitable upgrade comes along. There may well be a few dozen people still using the original single-sided IBM PC disk drives that came with the low-serial, early-model machines. The rest, having discovered that commercial software no longer acknowledges these particular antiquities, long ago paid the then-considerable price of turning their old drives into decorative paperweights.

Granted, the PC's much-vaunted open architecture has saved many a pioneer's bacon. Even if your dust-covered ROM BIOS isn't up to handling hard disks or the EGA, you can swap it—for a fee, of course. And you can add just about any peripheral you can think of.

But pioneering has become more rigorous. The Daniel Boones of the AT world have been particularly unfortunate. Even though their machines might have saved them more time than their hard disk agonies frittered away, they're now a wee bit miffed that IBM doesn't offer them an official way to upgrade their machines to the new de facto 8-MHz standard or to plug in the new keyboard.

Or are they really so unfortunate? In typical low-serial fashion, the new ROM BIOS routines designed for the low-serial keyboard don't work quite as expected with many long-established programs.

Which confirms the Upgrade Theorem founded on Axiom 1: Don't buy early versions of upgrades and revisions, either. According to one recent article, the probability of introducing one or more new er-

Illustration: Warren Gebert

■ **STEPHEN MANES**

rors in a program while eliminating a known one ranges from 15 percent to near certainty. The theorem is corroborated by virtually every new release of an old standby replete with new defects.

TIME BOMBS Alas, you're probably not going to learn about these things from initial reviews, no matter how assiduously the reviewer performs his task. Back when software came in a Ziploc bag, you could usually find major bugs in a couple of minutes. Today, any program revealing its problems that fast is likely to find itself in the to-be-reformatted section of the disk organizer.

Increasingly complex software and hardware create subtler problems that don't crop up until you've explored the product much longer than most reviewers can afford to. Reviewers can't be expected to discover a software glitch that turns up only on machines with precisely 640K bytes of memory, only when a particular type of memory-resident software is loaded, or only on certain ROM versions of certain PC clones.

SELF-DEFENSE One sensible defense is to wait until user groups and the computer press publicize the screwups. Agonized howls rose up pretty fast about the glitches in the new editions of *1-2-3* and *dBASE III*, not to mention IBM's BASIC compiler, network software, et cetera. And major incompatibility problems tend to surface quickly. Obviously, it makes sense to run your software on the machine you're interested in before you fork over your cash for it, but the more obscure the machine, the less likely you'll be able to.

Besides, there are plenty of anomalies left even in mature products that won't turn up on your system until the worst possible moment. So if you're planning on devoting your data to any pioneering system, draw those wagons in a circle. Write down the worst possible scenarios you can possibly imagine, and then simulate them with the precise configuration you're thinking of using.

Create a gigantic dummy file, and see what happens when you try to modify it. Use a RAMdisk to simulate a disk-full condition, and see if your data can survive it. If you've got a network or multiuser system, have a couple of users try to modify the same file and record at the same time.

You may not like the results, but when you finally get through to the support people after listening to half an hour of "The Valley's Only Lite Music Station," at least you'll be able to chuckle philosophically when you hear a dulcet voice coo, "What do you expect? It's only Version 4.370."

■ STEWART ALSOP

DIARY OF A PSEUDO POWER USER

Alsop knows a lot about the PC industry, but he's less of a techie than most people think. He tried to close the gap in a recent struggle to get his new Compaq running.

*P*C *Magazine* was kind enough to equip me with a computer recently. It isn't just any old computer, it's the best: a Compaq Deskpro 286 with 512K bytes of memory and a 30-megabyte hard disk, a Video 7 EGA, a NEC Multisync monitor, an Intel Above Board/AT with 2 megabytes of memory, a Hayes 2400B internal modem, and a Hewlett-Packard LaserJet Plus printer.

My lack of technical experience with computers has been something of a closely guarded secret, since I'm supposed to know all about the infernal machines. Perhaps that's why I have some empathy for people who are still trying to figure out how to use the things. Anyway, I figured I had better give the magazine its money's worth. So I decided to find out how to become one of those fabled power users who know how to write a CONFIG.SYS file and the difference between LPT and COM. This is my journal of discovery.

SATURDAY (That's right, Saturday. I've got a job to do and can't spend my working hours messing around with a computer.) I decide to install all the boards at once, just to see if I can get the thing to boot up right off the bat. Foolish me.

I take the case off the Compaq. This job appears to require a special nut driver, which I happen to have lying around from reviewing another Compaq model. How do normal people get the case off?

I have to take a second look at the hard disk and plug in its power cable. My fingers are too big and fat to maneuver the power-supply plug into the 2-inch-wide crevice behind the disk drive. A pair of pliers finally helps me get it in. Why did Compaq detach the power supply for shipping, particularly since this task added 20 sweaty minutes to the installation?

I swap the Compaq's video board for the Video 7, stick in the Above Board, and then stick in the Hayes board. There are now six boards inside the computer, including Compaq's hard disk card, memory board, and serial- and parallel-port card. I haven't even turned on the power yet: that must qualify me as a power user.

I slide the case back on, screw in the screws, plug the monitor cable into the monitor and the computer, and plug in the power cords for the monitor and computer. It looks great sitting there, but it's taken me a couple of hours to get this far.

SUNDAY I pop up to the office bright and early, stick the DOS disk in the computer, and push the switch. It boots right

up, and now I want to format the hard disk. Don't ask me why, but I decide to use IBM's PC-DOS instead of Compaq's. So I study the manual and discover that there is a command called FDISK for formatting hard disks.

Disaster looms: the computer won't recognize the hard drive. Guilt. Insecurity. Fear and loathing. I'm supposed to know what I'm doing and the computer won't recognize the hard drive. There's obviously more to being a power user than meets the eye. I run Compaq's diagnostics program. It tells me I have Error 1702-40, which is useless information since I don't have anything that tells me what that means. I think I messed something up by using IBM DOS on a Compaq. Maybe I hurt the controller card when I was setting up the hard disk. I call up 47th Street Photo, where I bought my equipment (they work on Sundays). They're distressed, since they formatted and checked the drive before shipping. I order a copy of Compaq DOS, which they've promised me I'll get on Tuesday.

MONDAY I do real work on my original computer.

TUESDAY Compaq DOS arrives as promised, along with a copy of Compaq's advanced diagnostics. I use the latter to do a very low-level format of the hard disk. After 4 hours, it gives me the same error code I got before. It took 4 hours to tell me what I already knew, which was nothing. I'm beginning to dream about being just another dumb user.

■ STEWART ALSOP

WEDNESDAY My deadlines are slipping by inexorably, and the unanswered phone calls are backing up like traffic at a toll booth. I get on the phone with 47th Street Photo's computer salespeople. By now, I'm sure they're wishing they hadn't sold me this computer. We determine jointly that neither of us knows what happened to the disk. They send a whole new machine overnight.

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THURSDAY Federal Express arrives with the new machine. The guy is not thrilled about lugging the new 59-pound machine up the stairs and the old one back down. (Have you ever wondered why the Compaq Portable 286 weighs some 25 pounds less than the Compaq Deskpro 286, even though the Portable has a built-in monitor?) This time, I decide to take it slow and install one board at a time, and so I remove the case, swap video boards, and hook up the monitor.

Compaq DOS features a command called DISKINIT, which makes hard disk formatting idiotproof. But my first DISKINIT takes 45 minutes to discover that virtually every track on the backup floppy I used is bad. So I format a more reliable-looking floppy disk: this time DISKINIT tells me quickly that I've got the wrong floppy for the drive I have. But it's the same drive that formatted the floppy. Fortunately, a real power user is visiting me and tells me to format with DOS 2.1 on my other computer and try that. It works perfectly, but I can't tell you why.

ODYSSEY'S END Voilà. I now have a formatted and working hard disk. One by one, I install the other boards and reconfigure the machine for each one. I end up with a perfectly functioning power system, with an 80286 processor, 2.5 megabytes of memory, 30 megabytes of storage, and high-resolution graphics. It only took me 6 days, including about 20 hours of real time, and I haven't processed a single word, put out a single page, communicated a single memo, or crunched a single number. But I have learned how to modify AUTOEXEC.BAT and CONFIG.SYS files, run diagnostic programs, and partition hard disks.

I'm still not really a power user, though. I have to admit to a primitive desire to use computers to get work done. I just spent a better part of a week getting the machine to start up correctly. I haven't even tried the printer, the modem, or any applications software. Sales of these machines produce revenues of more than $10 billion for their vendors: Why can't they spend some of that money developing a little technology that takes care of the machine for me? That way I could actually get some work done around here.

The 12-megahertz 286[12] and 10-megahertz 286[10] come complete with 1.2 megabyte floppy disk drive, 1,024K of high-speed RAM, 200-watt power supply and an AT-style keyboard.

Both feature SmartVu™, an alphanumeric LED panel that's a window on your world of computing, a look into the heart of the computer, reporting operating speeds and diagnostic messages in understandable English.

The 286[10] and 286[12] have been created by the best team of computer-hardware designers in the business. A totally new motherboard, custom ROM BIOS and proprietary circuits have been developed for this high-performance computing environment. And every 286[10] and 286[12] is bench-tested and run through an extensive burn-in before shipment.

PC's Limited was the first direct-response marketer to offer high-quality, low-priced PC-AT compatibles. PC's Limited has been a leader in pushing high-performance personal computing through price barriers. The experience gained from selling and supporting thousands of high-performance PCs to customers ranging from Fortune 500 companies to solo users has been applied to designing the most advanced personal computers ever produced: the PC's Limited 286[10] and 286[12].

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Scanners

Nobody believes in the paperless office anymore. In the ideal workplace of the future, stacks of paper will still arrive on our desks, but we'll be able to transform them effortlessly into ASCII characters and bit-mapped graphics. We'll edit, manipulate, and combine these words and images before printing them out on laser printers and sending fresh, typeset-quality pages on to clutter other people's desks.

Most of the components of this attractive scenario are already in place in our offices. The device that will handle the paper-to-screen transformation, however, is not yet a widely used peripheral. Most PC users perceive text and graphics scanners as clunky, inaccurate, and expensive. But changes in scanning technology over the past year have produced a new generation of scanners that may soon be as indispensable as printers and monitors.

A year ago, the desktop scanning market divided neatly into two categories. Optical character readers (OCRs), or text scanners, scanned printed text and produced ASCII output in one of several formats. These units, priced from about $6,000 to about $10,000, were intended primarily for use as data entry tools, notable in offices making the transition from paper to electronic storage. Graphics scanners, ranging in price from under $2,000 to about $4,000, were aimed at graphic arts, engineering, and document-storage applications. Only one machine, the Datacopy 700, combined text and graphics scanning.

Today, most available scanners have or will soon have both graphics and text capabilities. This year's crop of new scanners is

A year has made an astonishing difference in the scanner marketplace. Prices have dropped significantly, while capabilities have soared. The most important recent advance: with just one unit you can scan both graphics and text.

a large one: Datacopy has introduced the 730 series, which pushes its previous graphics resolution to 300 dots per inch. Companies that have been in the scanning business for years, such as Compuscan, Dest, and SpectraFAX (previously LaserFAX), have new products; companies like Tecmar that have been active in

■ Scanning hardware itself has not changed radically in the last year; most of the changes have taken place in the software used to process the scanned page.

other markets have entered this field; and new companies, like Palantir, have surfaced from out of nowhere.

Even the venerable Kurzweil 4000, which scans typeset pages, now has challenges in the market it created and owned just a year ago. Palantir's Compound Document Processor (CDP) scans proportional type without needing to be taught the typeface beforehand, handles page formatting without input from an operator, and processes graphic images.

The new scanners are smaller, and in some cases faster, than their predecessors. For example, Dest's new PC Scan, the smallest automatic OCR on the market, is small enough to fit unobtrusively between your system unit and monitor. (Oberon International's Omni-Reader, the smallest scanner available last year and my choice for product of the year, disappeared from view for a time and resurfaced twice—first advertised by Texas OCR Systems and then by G.A.S. International.)

In short, the scanner marketplace has changed dramatically in a year. The scanning hardware itself has not changed radically; most of the changes have taken place in the software used to process the scanned page. These include new methods for processing halftones, editing graphic images, compressing data, and combining text and graphics.

OCR TECHNOLOGY The first steps of the scanning process are essentially the same for both text and graphics. Depending on the scanner's design, either the page is moved over a fixed scanning element or the scanning element is moved over a fixed page. The most common method is to move the page through a paper path that can position and move the page incrementally for scanning.

Once a page is in position to be scanned, it is illuminated by a low-frequency light, usually red or yellow neon. The dark areas absorb the light while the light areas reflect it. The reflected light is focused and then aimed at a photodiode array or a CCD (charged coupled device), which translates areas of light and dark into binary data (0s and 1s).

From that point on, the data manipulation processes for characters and graphics are very different. Most text scanners digitize the characters a line at a time and then isolate them, character by character, into frames ranging from 24 by 40 pixels up to 30 by 50 pixels. The individual frames are stored in RAM for character recognition processing. The most common method of recognition is matrix matching, in which frames of scanned characters are compared against a table of known characters until a successful match is found. Most manufacturers of mid-range OCRs use some variation of this method. A more sophisticated method is pattern recognition, also known as topographical character analysis or feature extraction. This method uses shape tables instead of character frames. Components of the scanned characters are compared against the shape table, allowing a wider range of typefaces to be matched.

Almost all scanner manufacturers now also offer formatting software, which converts white space into tabs, margins, and line endings so that the text is readable by several popular word processing programs.

GRAPHICS No machine yet exists that can scan a page and interpret text and graphics in a single pass, although

Challenging the Scanners

At first glance, the four sample pages we used to test the scanners' capabilities do not look terribly difficult. Yet each page presented its own challenges.

The business letter and price list (top and bottom left) tested text-scanning features. The letterhead on the first page, which is not monospaced, could most OCR software and resulted in a trail of garbage characters. The letter is printed in the Courier 10 font, but it was produced on a Ricoh laser printer and is slightly thicker than the same font printed on a letter quality printer. This tested the software's ability to recognize fonts based on characteristics rather than strict matrix matching. The signature, like the letterhead, usually left a trail of garbage in its wake.

The price list helped us determine whether OCR formatting software can interpret tabs in the scanned text and format the output file with tab spaces or with white space. The decimal-aligned tabs on the far right further test the formatting software's capabilities.

The 18th-century etching of compositors (top right) is a photocopy, which we felt would be the typical source for many scanned images. The tightly spaced lines tested the scanners' ability to resolve detail—a test all nine passed. We included the last page, comprising related line drawings, in case the scanners could not resolve the detail.

Palantir's CDP comes very close. Graphic images are processed in a separate step. Most of the work involves resolving shades of gray into the appropriate pixel densities and compressing the massive amount of data produced by scanning a typical page. Scanner software has come a long way over the past year in both areas.

Commercial printers face much the same problem as graphic scanning software does: how to convert a picture to dots so that it can be printed. Line drawings are black and white; tonal quality is usually achieved by placing lines or dots closer together (crosshatching or stippling, for example). Line art is easy to scan because the demarcation between black and white is clear. Continuous-tone art is another matter. Photographs, pencil sketches, and pastel renderings have varying shades instead of clearly defined areas of black and white. To reproduce such pictures, printers use a mechanical process called halftoning, which breaks a picture into a pattern of black and white dots. Halftones are made by placing a screen between the image and

SOCIETY FOR THE PRESERVATION OF LEAD TYPE
1000 Industry Parkway
Manchester NH 02109   (603) 555-1212

August 8, 1986

Geoffrey Price
Metacorp Inc.
210 Highland Street
Suite 200-A
Manchester, NH 03104

Mr Price:

Thank you for your kind letter and generous contribution to the
Society for the Preservation of Lead Type. We feel that as
business races to embrace electronic desktop publishing, it is
important to pause for a moment and look back at the rich and
varied history that has made it possible.

Preserving lead types is not the work of anachronistic scholars
working in academia: our task is nothing less than to preserve
the secrets and "tricks of the trade" of an industry whose
history parallels the emergence of modern man. We feel we are
preserving not only type, but the history of education,
enlightenment, and freedom of speech. Thus your contribution
preserves lead type so that future generations may understand the
process and hand composition.

On the following page I have listed a number of sizes,
quantities, and prices for fonts of lead type. The price of the
type may seem very high, but remember that every character is
cast by hand in the traditional method. We do not use foundry
machines of any kind. I have also listed the composing sticks,
chases, wood furniture, quoins, quoin keys, and job case as you
requested.

I wish you success in finding the Albion or Columbia press;
unfortunately we do not know where you might start looking in
either the United States or Great Britain. Nevertheless, we hope
your work proceeds as planned, and that you communicate with us
often.

Yours,

Thomas Jenson

Thomas Jenson, Director

SOCIETY FOR THE PRESERVATION OF LEAD TYPE

This illustration shows traditional 18th century craftsmen
setting type. The job cases (center and left) hold a font of type
for the composer. Other job cases (background) could be placed on
the stands as needed. Note the composing stick in the left hand
of each compositor.

The man at the right is leveling a form of type locked in the
chase. He uses a small mallet to tap the form on a marble table.
Above these men hang freshly printed pages, pulled from a
proofing press.

Price List

Product	Quantity	Size	Price
Jenson Roman Text Type	1 font	8 point	$ 1099.00
Jenson Roman Pi Font	1 font	8 point	$ 799.00
Jenson Roman Text Type	1 font	10 point	$ 1099.00
Jenson Roman Pi Font	1 font	10 point	$ 899.00
Jenson Roman Text Type	1 font	12 point	$ 1199.00
Jenson Roman Text Type	1 font	14 point	$ 1299.00
Jenson Roman Titling Type	1 font	24 point	$ 1499.00
Jenson Roman Titling Type	1 font	36 point	$ 1499.00
Jenson Roman Titling Type	1 font	48 point	$ 1499.00
Composing Stick	1	6 inches	$ 59.00
Composing Stick	1	10 inches	$ 59.00
Printing Chase	1	14 x 18	$ 289.00
Printing Chase	1	18 x 24	$ 389.00
Quoins	24	4 inches	$ 59.00
Quoins	12	6 inches	$ 69.00
Universal Quoin Key	1	6 inches	$ 24.00
Printers Furniture	50	Assorted	$ 29.00
California Job Case	1	36 x 48	$ 459.00

See the next page for illustrations
of some of these products.

Upper Case

Lower Case

[4] Composing sticks

a photographic negative. Newspapers, which use coarse paper, use 65-dot-per-inch screens; magazines like the one you're reading can use much finer screens, from 100 to 120 dpi.

Most scanners have little trouble with line art, but continuous tone, even when it is halftoned, is more difficult. The scanner software does its best to resolve continuous tones into various dot densities. If the scanner can resolve the halftone dots, it will scan them; otherwise it breaks gray levels into dot densities based on internal

algorithms. The results are often similar to those achieved by photocopying a photograph; gray shades are converted into black and white and, depending on the type of photo, the gray may solarize or drop out altogether.

After the scanner software has decoded as much information about the page as possible, it must compress the data. A full page scanned at 240 dpi contains over 5 million dots; at 300 dpi it's nearly 8 million dots. That means the average page of graphics chews up from 1 to 1½ million

bytes of information. With the 32-megabyte-per-sector limit on hard disks, you can store only a handful of images before running out of space. Some users can get around this limitation by investing in a WORM (write-once, read-mostly) CD-WORM, but that is not practical for applications in which you want to reuse and change scanned graphics.

Most scanner software includes a data compression program that reduces the number of dots you need to store. Since the data-compression method usually follows

Scanners: Summary of Features

Product/ Manufacturer	List price	Size (inches; h × w × d)	Scanner interface	Maximum scan size (inches)	Single sheets	Bound material	Paper feed
				Paper Handling			
Canon IX-12 Canon USA	$1,685	3½ × 13 × 11½	Serial	10 × 24	Yes	No	Up to 5 sheets maximum
eSCAN Tecmar Inc.	$2,495	10½ × 13 × 13½	DMA interface card	8½ × 14	Yes	No	Single sheet, hand feed
Personal Scanner 2000 Electronic Information Technology Inc	$2,495	10½ × 13 × 13½	DMA interface card	8½ × 14	Yes	No	Single sheet, hand feed
Microtek MS 300A Microtek Labs Inc.	$2,500*	4½ × 15 × 17	Serial or parallel	8½ × 14	Yes	No	1 sheet at a time
PC Scan Dest Corp.	$2,785	4 × 16 × 11½	DMA interface card	8½ × 14	Yes	No	Single sheet, hand feed
Datacopy 730 Datacopy Corp.	$3,950	5½ × 15 × 19½	DMA interface card	8½ × 11	Yes	No	Single sheet, hand feed
SpectraFAX 200 SpectraFAX Corp.	$3,995	10 × 25 × 15	Serial	8½ × 14	Yes	No	
Compuscan PCS 230 Compuscan Inc.	$5,695	8 × 17 × 19	Serial	8½ × 16	Yes	No	50 page, bin type
Compound Document Processor Palantir Corp.	$39,500	10 × 17 × 29	Serial, Ethernet†, Massbus†	8½ × 14	Yes	No	50 page, bin type

N/A—not applicable. *Not including software. †Optional. ‡Also recognizes typeset faces.

the standards for Group 3 or Group 4 facsimile transmission machines, you can also use it to send a "fax" of your graphics image to a facsimile machine (see sidebar "The Fax About Image Scanning"). Typically, this process means using one dot for every three or four dots scanned and is acceptable for storage when the image doesn't need to be printed. Another method, which is more practical and does not corrupt the resolution, is to store portions of a page. Since the scanner stores white space as well as dots, you can edit the

graphic image using a program like Media Cybernetics's *Dr. HALO* or Zsoft's *PC Paintbrush* and grab a screen for editing and storage. In most cases you will want to edit the original anyway, and you can save megabytes of space this way.

Most available scanner software lets you size, edit, and print an image. The cSCAN and Datacopy programs allow you to merge scanned graphics with text by adding marks within the text file that define the graphic image area. The text file is printed from within the scanner software,

which grabs the graphic from the correct directory and inserts it into the text as marked.

MARKET SEGMENTS One reason so many scanner manufacturers have added graphics capabilities is to capitalize on the anticipated boom-time growth of electronic publishing. Almost all the manufacturers I spoke with see scanners as an integral part of that growth. It remains to be seen whether developers of desktop publishing software will see scanners as integral to

| | Text Scanning | | | | | Graphics Scanning | | | | | |
Speed	Monospace typefaces	Proportional typefaces	Output	Word processor format	Page format	Resolution (dots per inch)	Half-toning	Compression	File format	Graphics editing	Merge text and graphics
.67 pages/minute	Any standard monospaced font; 5–20 point size	N/A	N/A	WordStar, WordPerfect, MultiMate, or any word processor that doesn't take over keyboard	Paragraphs, centering, indents	75, 150, 200, or 300	Yes (stores up to 32 gray tones)	Yes	Bit-mapped/FAX	Yes	Yes, but text is bit-mapped
1 page/minute	Courier 10, Courier 12, Pica 10, Letter Gothic, OCR-A, OCR-B	N/A	ASCII text	PFS: Write, Volkswriter, WordStar 2000, WordPerfect	Paragraphs, centering, indents, tabs, form feeds	100–300 vertical, 200/240/300 horizontal	None	Yes	Bit-mapped, compressed print	Yes	Yes
1 page/minute	Courier 10, Courier 12, Pica 10, Letter Gothic, OCR-A, OCR-B	N/A	ASCII text	PFS: Write, Volkswriter, WordStar 2000, WordPerfect	Paragraphs, centering, indents, tabs, form feeds	100–300 vertical, 200/240/300 horizontal	None	Yes	Bit-mapped, compressed print	Yes	Yes
.67 pages/minute	Any standard monospaced font; 5–20 point size	N/A	N/A	WordStar, WordPerfect, MultiMate, or any word processor that doesn't take over keyboard	Paragraphs, centering, indents	200	Yes	Yes	Bit-mapped	Yes	Yes
2 pages/minute	Courier 10, Courier 12, Pica, Prestige Elite, Letter Gothic, OCR-B	Bold, Cubic, Madeline, Modern, Roman, Triad	ASCII text	IBM DisplayWrite Series, MultiMate, WordStar, WordStar 2000	Paragraphs, centering, indents, tabs, form feeds, underlining	N/A	N/A	N/A	N/A	N/A	N/A
1½ pages/minute	Courier 10, Courier 12, Pica, Prestige Pica, Elite, Prestige Epson Pica 10, Epson Elite 12, HP LaserJet Courier 10, OCR-A, OCR-B	N/A	ASCII text	IBM Personal Editor, DisplayWrite, MultiMate, Microsoft Word, Volkswriter, WordStar, WordStar 2000, WordPerfect	Paragraphs, centering, indents, tabs, form feeds, underlining	240/300	Yes	Yes	Bit-mapped, compressed print	Yes	Yes
N/A	N/A	N/A	N/A	N/A	N/A	200	None	Yes	Bit-mapped	Yes	Yes, but text is bit-mapped
2 pages/minute	Courier 10/72, Courier 12, Pica, Esteem Pica, Elite, Brougham 10, Letter Gothic	Bold, Bold Legal, Cubic, Madeline, Modern, Roman, Triad	ASCII text	DisplayWrite, SAMNA Word, Volkswriter, WordStar, WordStar 2000, WordPerfect	Paragraphs, centering, indents, tabs, form feeds, underlining	N/A	N/A	N/A	N/A	N/A	N/A
8 pages/minute	All fonts	All fonts	ASCII text		Complete page format or galley	300	Yes	Yes	Proprietary	Yes	Application-dependent

their growth. This potentially symbiotic relationship is still in the courtship phase.

Scanner manufacturers also hope to tap into a large existing base of fax machines. By adopting the CCITT (Consultative Committee on International Telephone and Telegraph) standards for data compression, scanner manufacturers make it possible to turn a PC into a fax machine and allow economical long-distance transfer of scanned graphics images from PC to PC.
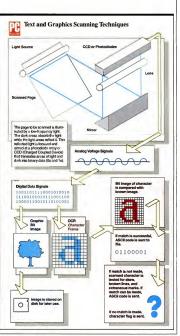
Scanners have come far in just a year, but they still have a long way to go before they become as commonplace as printers. A number of problems continue to hinder them from achieving widespread acceptance in the office environment.

TEXT PROBLEMS One problem that few scanner manufacturers have solved involves scanning dot matrix print. You might imagine that simple characters such as these would be the easiest to scan, but only a few manufacturers (Datacopy and Dest, with EIT planning to add the capability soon) can actually do it. The reason most commonly cited by manufacturers is that the standard 9 by 9 dot matrix charac-

Text and Graphics Scanning Techniques

Light Source

CCD or Photodiodes

Lens

Scanned Page

Mirror

The page to be scanned is illuminated by a low-frequency light. The dark areas absorb the light while the light areas reflect it. This reflected light is focused and aimed at a photodiode array or CCD (Charged Coupled Device) that translates areas of light and dark into binary base (0s and 1s).

Analog Voltage Signals

Digital Data Signals

100110111100010100010
111001010101011001100
100001100011101101001

Graphic Bit Image

OCR Character Frame

Bit image of character is compared with known image.

a

If match is successful, ASCII code is sent to file.

01100001

Image is stored on disk for use later.

If match is not made, scanned character is tested for skew, broken lines, and extraneous marks. If match can be made, ASCII code is sent.

If no match is made, character flag is sent.

?

ter cell doesn't have enough detail to be scanned. Most OCR character matrices are about 30 by 40 dpi, four times more detailed than the average 9 by 9 dot matrix character matrix. The OCR matrix, which can misread a speck of dirt smaller than the dot of an *i*, cannot recognize the spartan detail of dot matrix print.

Another deficiency is that most scanners can scan only an entire page. The ability to scan areas of data selectively, which only Palantir's CDP can do, would be a big improvement over standard page-oriented text scanning. A related problem is data formatting: all text scanners offer some form of text formatting that allows text to be placed in a compatible file format for your word processor, but one OCR software package offers a similar option for entering data in a spreadsheet or database. This capability would make scanners attractive to a wider audience.

GRAPHICS PROBLEMS Graphics scanning is relatively new, and its deficiencies may be corrected over time. Despite some improvements in data compression and scanning resolution, though, several areas need immediate attention. The single biggest problem is that scanned graphics are bit mapped, while most CAD software uses vectors. The CAD market is larger than either the publishing or fax market, yet no one has come out with software that makes the conversion from bit-mapped to vector graphics possible. Savvy third-party developers, take note.

The other major deficiency is not the fault of scanner manufacturers but of the PC hardware itself. Even enhanced graphics monitors are woefully inadequate to the task of displaying a scanned graphic page, and even if they could do it, the 640K-byte address space is too small to display a whole graphic without severe data compression. Scanner manufacturers are caught in the middle, as are users. Until the industry resolves the questions of memory addressing and high-resolution bit-mapped displays, graphics users will have to content themselves with working on portions of a page separately.

FUTURE PROMISE In spite of these deficiencies, the scanner market holds much promise. Most of this year's products offer a wider range of font recognition, improved text formatting, and improved user interfaces. The graphics-editing capabilities that were just becoming available last year are now mature products. Although a year has made a significant difference in the scanner market, you needn't fear that the scanner you buy today will be outdated in another year. Most of this year's major improvements have affected software, not base hardware: if you bought your scanner last year, you probably needed no more than a software upgrade to bring you up to date. Next year's changes will probably be similar.

—Tom Stanton

Tom Stanton is a free-lance writer based in Manchester, New Hampshire. Diane Burns and S. Venit are frequent contributors to PC Magazine.

Canon IX-12

The new Canon IX-12 is the smallest and lowest-priced scanner reviewed here, but it offers all the functionality of more-expensive models. Unfortunately, I ran into a few glitches trying to get it running, owing primarily to the fact that the machine was still not officially released at the time I tested it.

The compact Canon IX-12 measures a mere 3¾ inches high by 13 inches wide by 11½ inches deep. It has a single power-on light on top. Pages feed one at a time through the front of the scanner and exit at the back, where a hopper catches them. The panel between the paper entry and exit slots opens easily so that paper jams can be easily cleared. The sensitive charged coupled device scanning hardware is recessed—only the rollers are exposed when you lift this panel.

INSTALLATION The Canon IX-12 comes with a full-sized card to be inserted into an expansion slot, *PC Paintbrush* software configured for use with the Canon scanner, and OCR Systems' *OCR* software, which Canon calls *Typereader*. You must configure *PC Paintbrush* for your monitor and printer and add IX8ND2 (a batch file that runs the program and sets the interrupt vector) to the PAINT.BAT file.

PC Paintbrush handles graphics scanning. It is directly compatible with other programs that can merge text and graphics,

Canon bundles PC Paintbrush with its scanner. In this screen, which shows the scanning dialog box, you can adjust various aspects of the image, including its resolution.

The Canon IX-12 is the tiniest one (at $895) most inexpensive scanner we tested. Its small footprint (13 by 11½ inches) makes it a good candidate for desktop use.

SOCIETY FOR THE PRESERVATION OF LEAD TYPE

This illustration shows traditional 16th century craftsmen setting type. The job cases (center and left) hold a font of type for the composer. Other job cases (background) could be placed on the stands as needed. Note the composing stick in the left hand of each compositor.

The man at the right is leveling a form of type locked in the chase. He uses a small mallet to tap the form into a marble table. Above these men hang freshly printed pages, pulled from a proofing press.

One of the test pages, scanned by the Canon IX-12 and printed out by an Epson MX-100. The quality is not very high but would suffice for many draft or in-house applications.

and it also comes bundled with other scanners, such as the SpectraFAX 200. You choose the scanning option from *PC Paintbrush*'s Page menu.

OCR Systems' *Typereader* software takes care of text scanning functions. Much of the IX-12's high-end functionality comes from this sophisticated software, which also comes with some of the more expensive scanners. Canon and OCR Systems claims that *Typereader* can read text as small as 6 points ($1/12$ inch high) as well as headline type.

TEXT AND GRAPHICS SCANNING

Unfortunately, we could not test the IX-12's text scanning capabilities thoroughly with our prerelease equipment. The scanner repeatedly stopped after scanning only half the page. Canon and OCR Systems expect this problem to be remedied before the product's official release.

We had better luck with the graphics scanning facility. It took the IX-12 1 minute, 19 seconds to scan a full 8½ by 11-inch page. We couldn't get the 300-dpi scan to print on our Epson printer, but the 200-dpi and 150-dpi versions of the same image printed easily. The problem of printing 300-dpi images to lower-resolution printers should be corrected with the final release of the product.

Despite our difficulties with the

prerelease version of this equipment, we liked this scanner a lot. Its compactness and price certainly enhance its attractiveness. Though it probably won't be cost-effective for high-volume uses, it will be an obvious choice if price is a major consideration, a good choice if aesthetics and size are important, and a justifiable choice for anyone who simply wants to experiment with scanning technology.

—Diane Burns and S. Venit

eSCAN and Personal Scanner 2000

Tecmar's eSCAN and Electronic Information Technology's Personal Scanner 2000 are essentially the same machine. There are some minor differences, mostly in the menu structures (eSCAN uses function keys, PS 2000 uses numeric keys), but the hardware is identical. EIT manufactures the scanner and sells it to Tecmar.

The eSCAN and PS 2000 are low-cost systems that offer both text and graphics scanning capabilities. Neither system supports image "halftoning" (a way of reproducing gray tones), although EIT representatives suggested that halftoning might be available in a later software release. The lack of halftones is restrictive if you plan on scanning photographs, but if the bulk of your graphics is black-and-white line art like charts, diagrams, schematics, and drawings, you'll find appealing features in these systems.

HARDWARE Generally, text and graphics scanners use one of two methods to capture a page. Some systems transport paper past a window that illuminates the line and projects it onto a charged coupled device (CCD), while others move the optics over a fixed scanning bed. Both methods require precise mechanical tolerances, particularly for text scanning, where a 1-pixel error per line can trigger a whole page of unrecognized characters.

The eSCAN and PS 2000 hardware uses a unique design that has only one moving part. The scanning bed and optics are positioned at right angles to one another, with a small mirror mounted at the common perpendicular. A page is placed on the curved scanning bed and illuminated with two neon lights. The mirror pivots in small steps, reflecting each line into the scanning optics and CCD. Most of the bulk in the eSCAN/PS 2000 hardware consists of empty space required for the scan optics.

Single sheets up to 8½ by 14 inches long must be placed facedown, headfirst into a guide at the front of the machine. Page orientation is critical for optical character recognition; graphics can be scanned using other orientations, but you have to read and rotate them before they print correctly. The curved scanning bed does not easily accept books or magazines for image scanning, even with the removable cover; you're better off photocopying the desired page, or removing the binding and scanning it as a single sheet.

The contrast control on the front panel lets you make adjustments for light or dark copy. Tecmar's documentation doesn't give you much guidance on contrast control. Although it is mentioned twice ("You may want to adjust the Contrast Control"), the manual gives no concrete examples except to recommend that you use higher numbers to scan lighter images and lower numbers to scan darker images. You must experiment to see what works for you.

SOFTWARE Both the eSCAN and the PS 2000 use menus to direct users to specific areas. The eSCAN menu selections are made using function keys; the PS 2000 selections are made by typing a number and pressing Enter. The Esc key takes you back one menu level and also exits the program. If you are two menus deep and you hit Esc three times, you'll find yourself at the DOS prompt.

The main menu lets you select graphics scan, text scan, text and graphics merge, file directory, utilities, text and communications, and graphics edit. The utility menu has options for defining the command name and pathname for the word processors, graphics editors, and communications programs on your hard disk. You must assign a graphics editor to work within the menus if you want to edit scanned images. You should also define a word processor, since the text/graphics merge software works best within the menu sys-

Left: the version of Tecmar's eSCAN that the company was shipping at press time. The new version of the eSCAN will look exactly like Electric Information Technology's Personal Scanner 2000 (right). The PS 2000's unique design has only one moving part, making scanning a practically foolproof process for single sheets. It's more difficult to scan a page from a book or magazine.

tem. Having defined both a graphics and text editor, you can easily scan, edit, and print text, graphics, or a combination, without ever leaving the menus.

The eSCAN and the PS 2000 allow elaborate color editing in their setup menus. You can select from a full range of colors for foreground, background, border, titles, and menu entries. When I tried selecting colors, I noticed that the main menu always returned to its original color, white on black, while submenus displayed the colors I selected.

The diagnostics menu lets you test the hardware. You can turn the neon lights in the scanner on or off, turn the mirror motor on or off, and place the mirror in the "home position." This menu might be more useful if it had a few messages reporting hardware status, such as "No response from scanner—Check hardware" or "Mirror not in home position—press F4." While I'm on the subject, I noticed that some error messages flash on-screen for less than a second, which is more irritating than no message at all.

INSTALLATION You must install a short-slot interface card to connect your PC to the eSCAN or PS 2000. The interface card has eight DIP switches that let you set the hardware hex address. However, with Tecmar's documentation I couldn't tell if my board was set up correctly—the book states that DIP switches are on when the dots are down, but my DIPs had dots on both ends (none of the three types of DIPs shown in Appendix C resembled the ones on my board). Once I got my bearings and tested the switch position with a voltmeter, the eSCAN responded to its diagnostics and was ready.

Software installation is straightforward. The INSTALL.BAT file creates a subdirectory on the hard disk, copies the software into it, and displays a hardware setup screen upon completion. You set the line frequency, default colors, default font recognition files, and hardware defaults in the setup mode. The eSCAN and PS 2000 support the XT, AT, Compaq, and true compatibles. The support for video boards is impressive: CGA, EGA, related compatibles, Hercules, and, of course, Tecmar's Graphics Master. Printer support includes IBM's graphics printer;

over a fixed scanning element, or the scanning element is a page, both of which have their respective advantages and di most common method is to move the page through a paper path and increment lines for scanning.

Once an area is ready to be scanned, it is illuminated by a low-frequency light, usually red or yellow neon. The dark areas absorb the light while the light areas reflect it. It is the reflected light that is focused, collimated, and then aimed at a photodiode array or CCDs (Charged Coupled Device) which translates areas of light and dark into binary data (0s and 1s).

From that point on the data manipulation for characters or graphics is very different. With most OCRs, the characters are usually digitized a line at a time and isolated, character by character, into frames ranging from 20 to 40 pixels up to 30 by 50 pixels. The individual frames are stored in RAM for character recognition processing.

The most common method is called matrix matching, where frames of scanned characters are compared against a t characters until a successful match is found. Each manufact used this method in a number of ways to speed up processing, but

Like most of the scanners reviewed here, the Tecmar eSCAN/EIT Personal Scanner 2000 lets you merge text with graphics. This capability is especially useful for desktop publishing applications.

Epson's RX, FX, or LQ printers; the QMS Laserprinter; and Hewlett-Packard's Laserjet Plus. The hardware setup menu writes a file called HARDWARE.DAT that you can modify if you change your system.

The last step in installing the software is scanner calibration. Although the HARDWARE.DAT file contains certain default information, you need to run the calibration routine to synchronize the mirror and related scanner hardware with the clock speed on your system. You scan a

special calibration sheet, which is a series of horizontal lines that the software uses to check the mirror. You can scan images without calibration, but the *OCR* software needs this information to scan text accurately for recognition. You run calibration only once unless you change systems.

GRAPHICS SCANNING I scanned the samples on both the eSCAN and PS 2000 with little difficulty. After positioning the page, I selected the Process Graphic Image menu. The submenu allows selection of

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scanning parameters, such as scaling, resolution, and image position. Once you define those parameters, type select Scan, enter a filename, and wait for a minute while the system starts scanning (you can hear the mirror move into position and rotate). In a few seconds the screen begins to display a portion of the graphic. After a few minutes, depending on the size of the picture, eSCAN beeps to indicate the scan is finished (an on-screen message would be more helpful). Pressing Ctrl-Alt-F1 displays the scanned image. Pressing the Space bar toggles the black/white areas (positive or negative image). My first sample (the 18th-century etching) took 3 minutes to scan completely; the second sample (a group of line drawings) took only 2 minutes.

The maximum resolution is 240 by 240 pixels per inch, which is about average for scanners. Although this resolution matches the Epson printer at its highest density, it is lower than the output resolution of most laser printers (300 pixels per inch). But matching this scanning resolution is important if you plan on publishing with a laser printer, so the eSCAN and PS 2000 fall short of the mark here.

Scanned files are stored in SIF (scanned image file) format when you first scan them. The SIF format is not compressed: the 18th-century etching, with all its detail, took up 263K worth of space. Once you have edited an .SIF file and are satisfied with it, you can compress it into DIF (display image file) format for display and PIF (print image file) format for printing. The DIF format follows the Group 3 (CCITT) facsimile compression standard.

SCANNERS IN DESKTOP PUBLISHING

A scanner can be an indispensable link in the desktop publishing chain, allowing users to merge complex images into their reports and newsletters.

One of the fastest-growing applications for scanners may well be the desktop publishing market, which some observers have predicted will be a multibillion-dollar industry by 1990. In its highest form, desktop publishing is the production of fully composed page layouts—including typeset text and graphic images—using a personal computer, page composition software, and a high-resolution output device like a typesetter or a laser printer. Ideally, you can merge scanned images on the same page, preview the page on-screen, and print it directly to a laser printer, camera-ready for reproduction.

Scanners have not played a major role in this process, but that's likely to change. For one thing, the price of the scanning hardware, like the price of high-resolution laser printers, is falling into the affordable range. This year, you can spend under $3,000 for a scanner that can perform some of the same feats as equipment that cost over $30,000 2 years ago. Scanning lets you incorporate more-complex graphics into your published pages. Users who already work with *PC Paint* or *PC Paintbrush* know that some images—complex logos or fine illustrations, for instance—take hours to re-create on-screen; these same images take only a few minutes to scan. In-house

newsletter departments that now pay high prices for halftones of photographs of new and promoted employees will find that 300-dot-per-inch scanned images are an acceptable alternative. In either case, the low cost of the new scanners makes the purchase easy to justify.

Professional graphic artists, photographers, and printers consider scanned images inferior to traditional halftones, even when the images are printed on a 300-dpi laser printer. For many desktop publishing applications, however, the quality is adequate. Lots of people already use low-cost scanners with the Apple Macintosh, pulling scanned images onto page layouts, merging them with typeset text, and printing out camera-ready pages on laser printers at 300 dpi or typesetters at 1,200 or 2,400 dpi.

Desktop publishers who are willing to sacrifice true halftone quality in exchange for on-line image access and in-house control of production will happily invest in low-end scanning devices. These pioneers will be able to produce simple images for their newsletters and illustrated documents with little effort. Once software developers are convinced that this is a market worth supporting, we'll have access to all the software and printer drivers required for integrated desktop publishing on the PC.—**S. Venit**

This is not a coincidence: EIT and Tecmar plan to announce fax software that can send or receive facsimile images. The communications option in the menu is obviously designed to accommodate fax now, but I suspect the new software will make the most of this menu option. One advantage of fax software is obvious: a PC without a scanner can receive graphics images for editing or merging with text.

.DIF and .PIF files are created in the Graphic Processing submenu. You can

specify a horizontal scaling factor from .1 to 2.5 times original size and a vertical scaling factor from .1 to 2.0 times original size. You can also shift the position of the image in the file in tenths of an inch from 0.0 to 5.0 (top and left margin).

It took 5 minutes each to create a .DIF and .PIF file of the etching; surprisingly, it took just as long to create the .DIF and .PIF files for the second sample. Having created all these files, I discovered that the .DIF files were useful for displaying im-

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ages quickly, creating composite (overlay) images, and editing—but you can't print them. Similarly, the .PIF files can be printed, but they cannot be edited. Furthermore, compression only goes one way: SIF to DIF or PIF format. There is no DIF-to-PIF conversion, so if you edit the .DIF file you can't print it unless you use the print utility in your graphics editor. Since I needed the larger .SIF file to edit or merge graphics with text, I wasn't sure what advantage the DIF and PIF formats offered.

GRAPHICS EDITING You must purchase a separate graphics editing program for the eSCAN and PS 2000. Although there is a module called the Extended Graphics Editor, this option has no editing capability. Its primary purpose is to display files in compressed (DIF) and uncompressed (SIF) modes and to scroll and position a portion of the image for editing. Once you select an area, you must use a third-party editor to grab the screen. These two scanners support Media Cybernetics' *Dr. HALO II* and Zsoft's *PC Paintbrush,* two of the more popular paint programs for the PC.

The documentation on this subject is sparse or nonexistent. Tecmar provides exactly three brief paragraphs on the necessary steps for editing an image in the Extended Graphics Editor: grab screen, call editor, replace edited portion with Ctrl-Alt-F2. The rest, it seems, is up to you. For example, the manual doesn't mention that you should add the necessary screen-grab-

bing commands to your AUTO-EXEC.BAT files before you try to edit a file (also, a sample of the necessary steps would have been nice).

■ **The best feature of the eSCAN and PS 2000 software is its learning mode. Using** *OCR* **diagnostics, you can teach the software to recognize an unfamiliar font.**

If you use an .SIF file, you can edit only a portion of the screen; if you edit .DIF files, you can usually grab the entire screen. It is not clear whether you can create a blank .SIF file and add graphics to it with *Dr. HALO II* (I never was able to do this). Editing is straightforward: I added a few words to the etching and cleaned up some fuzzy areas near the compositor's hand. One area of the line drawing (the type case) was of very poor quality, but this area could not be easily repaired. In most cases the editors are useful only for light cleanup; major surgery should be handled with care.

TEXT SCANNING Before scanning, you set OCR options for such factors as font, lines per inch, page size, and scanning margins. You can scan and recognize in one step or scan the text and run the recognition software later. I liked the second option best because at times I wanted to get the pages into the system and fuss with the files later (using the actual pages for reference). I used both methods on the sample pages.

When I scanned first and recognized later, it took less than 5 seconds to scan each page, but recognition went much slower: 50 seconds for the first page and 40 seconds for the second. In the scan-and-recognize mode, the first page took 60 seconds and the second took 53 seconds. Both

the Tecmar and EIT software had some difficulty with my Courier font: on the first page it didn't recognize 11 characters and on the second page, 9.

Text can be used as is or edited within the OCR submenu. Editing, or previewing, lets you go through the recognized file and search for uncertain characters (highlighted) or unrecognized-character flags (highlighted question mark). You enter the correct character as you edit. You can also disable all flags and use a spelling checker, which may be easier on longer text files. It took only a few minutes to edit both files.

The standard file format is ASCII text with CR/LF for line endings. You can use this file, or format the text for your word processor. You can format the text automatically during recognition or in a separate step within the menu. You select a file format (a generic file, *PFS: Write, Volkswriter, WordPerfect,* or *WordStar*), preview a text file, then press F4 to save the file in the output format selected. For my sample files I selected automatic *WordStar* formatting. Paragraphs, tabs, and centering came out correctly, although the decimal-aligned tabs wandered a bit (redefining the tab in *WordStar*'s ruler solved the problem). The underlining was lost and had to be added to the file.

The best feature of the eSCAN and PS 2000 *OCR* software is its learning mode. Using *OCR* diagnostics, you can teach the software to recognize an unfamiliar font or a font similar to one it already knows. The learning process, however, must be run in scan-first/recognize-later mode. Recognition is much slower, but once the software learns a font it can usually progress through scanning and recognition with few errors. If you happen to have a slightly off-brand font, such as I used, or documents with a number of broken characters, the learning mode is worth the extra time.

OCR diagnostics displays an unrecognized character next to a reference character. You can shift the character cell until the unrecognized character is isolated, then grab the character for inclusion in the font file. For example, the lowercase *i* in my example was much thicker than in the reference font. After I added the thicker character to the Courier 10 font file, the software could compare two versions of the *i* character—mine and its own—and

recognize either one. There are limits to the number of characters you can add to an existing font before performance is degraded; beyond these limits you can build a new recognition font file and use it instead of existing font files. Diagnostics is not limited to alphabetic characters: you can teach the software to recognize any of the 256 ASCII characters by pressing Alt and entering the ASCII number in decimal.

MERGING TEXT AND GRAPHICS FILES

You merge text with graphics by creating a text file and adding an index mark and the .SIF filename. The first index sets the upper-left-hand corner of the graphic, the number of the graphic, and the filename. The second index sets the lower-right-hand corner. The area between these two indexes must be blank, but you can add text anywhere else outside of it.

You can scale graphics within the text file by adjusting the position of the indexes. For example, the file directory showed that the etching was 81 characters wide and 64 lines long; when I placed my first index at line 1, column 1, and the second at line 32, column 40, the software automatically reduced and printed the graphic at half size. You can also enlarge graphics by reversing the procedure. You can place one graphic on top of another, hiding a portion of the first graphic, or you can overprint the two images using a special index mark. The indexes do not crop graphics, so unless you edit the image you must use the entire file.

You can use any text or word processor to merge graphics. If you want to format text using a word processor, you must print to a disk output file. I had defined WordStar as the callable editor in the menu utility, which made it easy to move between word processing and the merge menu. The preview feature shows an outline of the regions and the .SIF filenames where the graphics will appear within the text, but not the actual image, so it has limited use. Printing takes anywhere from 10 to 15 minutes, depending on the complexity of the graphic.

I used two reduced versions of the sample with a few lines of text, which took 11 minutes each to print. The full-size version of the etching took a full 15 minutes. I noticed that the text line spacing was altered

in these merged files. The first few lines printed close together, then were spaced farther apart once the graphic was introduced. After several attempts I discovered that this was always the case and that I could not alter it. I checked the text file for stray line-spacing codes, but there were none.

The eSCAN and PS 2000 systems have a number of good points. The hardware should be easy to maintain since it has only one moving part, and the calibration program ensures that it will work on most compatibles. The software's menu structure is easy to use and allows customization for callable programs on the hard disk. Scanning resolution is good, and the OCR's learning mode makes it particularly versatile. My few reservations concern the lack of halftoning capability in the graphics scanning software and the lack of an integrated graphics editing program. You have to purchase a separate program and deal with poor documentation, but graphics editing works rather well once you've installed it. Overall, these are good, reasonably priced general-purpose scanners with some excellent OCR features.—Tom Stanton
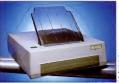
Microtek MS 300A

Microtek Labs' MS 300A, a 300-dot-per-inch image scanner, offers three graphics scanning modes: line art, halftone, and mixed. You can adjust contrast and brightness control settings in 14 steps on each scale. The scanner's hardware can also be used to scan text, in conjunction with software available from OCR Systems at extra cost.

Microtek Labs' MS 300A has a streamlined, printer-like appearance. Pages are fed in one at a time using the paper guide on top of the scanner.

HARDWARE

The 18-pound Microtek MS 300A has a streamlined appearance—it's 4½ inches high by 15 inches wide by 17 inches deep. Only two small status lights ornament the top, indicating "power on" and "ready." The default scanning frame size is 8½ by 11 inches, but you can change this setting through software to scan an image as large as 8½ by 14 inches or as small as ⅓ inch square on a minimum paper size of 3 inches by 3 inches. The image sensor is a linear array charged coupled device with 300- by 300-dpi resolution.

The paper guide, required for feeding one sheet at a time through the rollers, stands upright on the top of the scanner, and pages are ejected through a door on the front. The paper path takes each sheet straight across rollers from top to bottom. If the paper jams, you must remove the roller assembly from behind the exit door to get the sheet out. It's possible, then, to free a jam, but certainly more-direct access would be preferable.

OCR software from third-party manufacturers such as OCR Systems can access scanned data through the MS 300A's TTL-compatible parallel interface in two ways: through a "mailbox" type channel or through a high-speed direct memory access (DMA) channel. The optional serial interface operates at 9,600 to 57,600 bits per second and supports both RS-232C and RS-422 logic. Maximum scanning speed is 9.9 seconds for an 8½- by 11-inch document using DMA transfer.

INSTALLATION

Installing the MS 300A is simple enough. You insert the parallel interface card supplied with the scan-

EyeStar software handles the MS 300A's scanning features. This screen shows the scanned image as well as the scanning menu, which lets you adjust for contrast and brightness.

ner into an expansion slot in the PC and run the installation program. (The scanner can connect to a serial port as well, but we did not test this option.) You may also need to run a utility to configure the system if you don't have the default setup: a 300-dpi scanner (Microtek also makes 200-dpi machines), a Hercules graphics card, and a Hewlett-Packard LaserJet or LaserJet Plus. If you use a Corona LP300 Laser Printer, you must load the LP300 driver (supplied by Corona) into RAM before starting up EyeStar, the graphics scanning software that comes with the MS 300A. Also, a mouse installation program makes a VisiOn PC mouse model M-1 or M-2 available as an alternative to the cursor movement keys.

The manual recommends that you override DOS's normal limit of no more than 8 files open at a time by using the FILES command to set the limit up to 20 files. EyeStar lets you retrieve as many as nine different scanned images at a time and merge them with an EyeStar text file—a procedure that requires 10 files to be open simultaneously in addition to the program and DOS files.

The scanner comes with a technical manual for the hardware and a well-illustrated user's guide for the scanning software. Although the software works well and is easy to learn, the manuals themselves have plenty of room for improvement. For starters, Microtek could include such basics as an index and running heads.

SOFTWARE Because many scanned images require more storage space than a floppy disk can accommodate, you need to run EyeStar on a hard disk system. The

manual recommends that you work with at least 1,056K bytes of free disk space, and preferably more than 1,572K. As mentioned before, you can merge up to nine image files with text if you set FILES=20 in your CONFIG.SYS file.

The program includes a conversion utility for its graphics files that lets you convert EyeStar files to and from GEM Paint, PC Paint, and PC Paintbrush. The disk also includes printer drivers for the Epson FX series of dot matrix printers, as well as such laser printers as the Corona LP300, the Canon LBP-8 A2, and the Hewlett-Packard LaserJet or LaserJet Plus.

OCR, a text scanning program from OCR Systems, turns the MS 300A into an optical character reader (the Canon scanner also uses OCR). The system requires at least 384K bytes of RAM to run OCR (less than image scanning requires), but 640K is still preferred. A graphics card is not required, however. Like Palantir, OCR Systems uses the pretrained topological analysis approach to reading characters (an approach considered superior to either matrix matching or user-trainable topological systems) and adds contextual analysis to correctly distinguish numbers from letters of the alphabet. OCR is unique in that it is not sensitive to size and can accurately read type that has been reduced or enlarged.

The OCR disk includes FORAD (Format Adapter), a memory-resident utility for converting scanned text into MultiMate, DisplayWrite, WordStar 2000, CanoWriter II Plus, PC-Write, Symphony, and other word processing program formats. (WordStar and WordPerfect can accept the ASCII files as scanned without

further conversion through FORAD.)

(You can purchase OCR directly from OCR Systems Inc., 3430 Progress Dr., Suite 1, Bensalem, PA 19020; (215) 638-2174. The price is $495.)

TEXT SCANNING We tested the Microtek scanner and the OCR software on a Compaq Plus with 640K bytes of RAM, using WordStar to display the OCR results. The OCR menu options, such as adjustments for image darkness and paper size, are selected by function keys. The MS 300A read the price list accurately, although the tabs did not align properly. It also scanned the Courier portion of the letter perfectly the first time but introduced two typos on the second reading of the same sheet. On both readings, some lines that should have been flush left appeared with a space at the beginning, and some characters that were overwritten by the handwritten signature on the letter were misinterpreted by the reader. We were surprised to see that the scanner read parts of the typeset letterhead, though not with enough accuracy to make it feasible for extensive use in reading small, proportionally spaced text. It took 1 minute and 6 seconds to scan a full 8½- by 11-inch page.

When scanning a page of proportionally spaced type (Bigelow and Holmes's Lucida face), the software read the book-

TAKE IT TO THE LIMIT

How far can you push a scanner before you discover its limits? Tom Stanton tested Tecmar's eSCAN and the Datacopy 730 to find out.

The artwork samples with which we tested the scanners, while challenging, were not of particularly poor quality, nor did they have any continuous tones. So I wondered what would happen if I stopped playing by the rules and threw two machines the most-difficult examples I could find.

eSCAN Since Tecmar's eSCAN does a good job of scanning a wide variety of pictures, as long as they are black-and-white line drawings (like graphs, charts, and schematics), I tried scanning several photographs. A plain black-and-white photograph tends to solarize because eSCAN cannot resolve the endless shades of gray. The result is a kind of silhouette of the darkest and lightest areas.

However, a photocopy of a photograph scans a little better. It seems that the photocopier fills in what the scanner rejects or interprets as black or white, and the scattered toner acts as a kind of mock halftone. Since the scanner can easily pick up small black dots of toner, by adjusting the contrast on the scanner (if possible) you can manipulate image quality. This process requires experimentation and may not work on every photo.

DATACOPY 730 The Datacopy 730's halftoning capability is remarkable. After this machine scanned my test pages, I

threw it everything I could find: black-and-white photographs, color photographs, blurry family photos, magazine ads, and a collage of all of these. I am happy to report that the 730 did not choke on any of them, although you may have to experiment with contrast control to get color photos to scan correctly.

Black-and-white photographs or reproductions yield the best results. The scanned output resembles a sketch with highlighting produced by stippling. The 730's halftoning process is actually more a conversion from continuous tone to line art. Gray tones in the middle range (30 to 70 percent) pose the greatest challenge, but the 730 usually makes the right choice. Color photographs are harder, and predicting the result is not always easy. In general, color photos scan with more blacks and darker grays, but the outcome depends on the quality and intensity of the color. For example, color photos of my family were generally darker and scanned with more blacks and dark grays. Commercial photographs, where colors are more intense and contrasts are sharper, showed a much wider range of grays, particularly if they included lighter shades. Since the 730 allows you to do multiple scans before committing an image to disk, it is easy to experiment and find the closest possible match. —**Tom Stanton**

it by typing ISTAR and hitting Return. The opening screen shows a rectangular image area on the left and the four main menu options on the right: Scan Image, Process Image, Mix Text and Image, and

text on a white background, for instance. You could select halftone mode for the photograph and line-art mode for the text—but the text would then be scanned as a bit-mapped image, not as ASCII characters.

Once you've selected all your options, you can save the settings to use on other scans. You can also scan and print the image before editing it—even before saving the scan or the settings—all through the Scan Image submenu.

To save the scanned image itself, you exit the Scan Image menu set and go to the Process Image option of the main menu. You can save the image exactly as scanned, or you can use *EyeStar*'s image-editing features to alter the image by cutting away or copying part of the image and pasting it elsewhere, rotating a selected part of the image 90 degrees left or right, turning it upside down, flipping it from top to bottom or left to right, and reversing all or part of the image's black-and-white areas. You can use the paint function of the Process Image submenu to draw lines in 11 different thicknesses; the paint function also lets you draw boxes and fill them with 16 different patterns. A zoom option lets you zero in and work on small details.

You can conserve disk space by saving scans in compressed mode. This mode will have no effect on the size or quality of the image itself. Compression is most useful with images scanned as line art, while complex halftone images will not shrink significantly. Our test image required over 600K bytes in noncompressed mode and about half that in compressed mode.

An image can be loaded into the Process Image window exactly as saved, resized proportionally, distorted (that is, resized nonproportionally), cropped to fit in the window, or merged with another image in the current window to create new images.

INTEGRATION The main menu's Mix Text and Image option lets you set up ASCII files that can merge text with as many as nine different scanned images. You can type the text directly into *EyeStar* or print *WordStar* files through *EyeStar*. By typing in text and merge commands in an ASCII file and printing it through *EyeStar*, you can merge text and graphics

weight serif font perfectly but erred often when reading bold, italic, or sans serif text.

GRAPHICS SCANNING To scan graphics, we loaded the disk files from the *EyeStar* disk into a directory on the hard disk and installed the program, then started

User-Defined Functions.

The Scan Image option leads to a submenu on which you can set contrast, brightness, scale (25 to 100 percent in 16 steps), grain (number of gray levels), and mode (halftone or line art). Through this submenu you also set the paper length, frame (area to be scanned on the paper), and windows (up to four areas within the frame, which will be scanned in the secondary mode). The windows feature is useful when you scan a page that includes a photograph with many gray tones and

on the printed page in almost any layout—text above, below, beside, or printed on top of the graphic in black or in reverse (white type on a dark background). However, in practice many trial printouts would be required to produce a complicated layout, since you can't preview the merged text and graphics on the screen.

The range of typefaces, styles, and sizes varies depending on the printer you are using. On the Corona LP300, *EyeStar* supports Courier, Bookman, and two sizes of a sans serif font. On the Epson FX-100 it supports the traditional Pica typewriter face, a condensed face, and two large type styles for headings and titles. On the Canon LBP-8 A2 it supports Courier only, and on the Hewlett-Packard Laserjet Plus, it supports two sizes of Times Roman and a 14-point bold Helvetica.

The MS 300A's relatively low price and sophisticated graphics capabilities make it an attractive candidate for users who already have a need for scanned line art or halftone images. Although it is possible to design small display ads, flyers, and illustrated manuals through *EyeStar*'s Mix Text and Image option, its viability for commercial applications is limited by the number of printers and typefaces available. However, we expect Microtek to pursue compatibility with more sophisticated laser printers and typesetters in the future.

Its acceptance of only one sheet at a time and its problems with reading tabbed material and proportionally spaced text (as with other scanners) are drawbacks for those who wish to use OCR Systems' excellent software with the Microtek hardware for scanning long documents, but the *OCR/MS 300A* combination is still useful for saving keying time on shorter documents. We expect OCR Systems, too, to stay in the forefront of scanning technology.—*Diane Burns and S. Venit*

▌▌▌PC SCAN

Dest Corp. was one of the first companies to recognize the need for reasonably priced, PC-compatible OCRs. The Dest 212 was an excellent general-purpose OCR, featuring an automatic sheet feeder, a scanning drum that opened clamshell-style to clear paper jams, simple two-but-

Dest Corp.'s PC Scan can fit neatly between your system unit and monitor. It currently scans only text, but graphics capabilities are in the works.

ton operation, and a standard serial interface. The *Text Pac* software allowed simple ASCII transfer or custom formatting for popular word processing programs and recognized most popular typewriter faces. (See "Midrange OCRs: Reliable and Reasonably Priced," *PC Magazine*, Volume 4 Number 14.)

Now Dest has added new OCR hardware to its stable. The PC Scan was built to be used as a true PC peripheral rather than as a special-purpose machine like the 212. The new *Text Pac* software designed to complement the PC Scan represents a significant change in the human-OCR interface. Overall, the PC Scan package is ambitious and promising, albeit with some room for improvement.

THE HARDWARE While the Dest 212 took over most of a desktop, the PC Scan is small: it's 4 inches high, 16 inches wide, and 11½ inches deep. The documentation shows the scanner (which can support up to 30 pounds) stacked between a PC system unit and monitor. There is a 1½-inch feed slot in the front and a status-light panel to the left, but no buttons; *Text Pac* software handles all the scanning functions. This is the smallest automatic scanner I've seen.

The illuminated display panel in front has five icon indicators for power, wait, ready, paper jam, and service. A numeric LED displays status codes that are explained in the documentation. The status codes guide users through specific problems and their resolutions. The rear panel has a power switch, a 50-pin cable connector, and a mysterious 9-pin connector that is not mentioned in the documentation.

The PC Scan accepts pages from 3½ by 3½ inches up to 8½ by 14 inches. Each page must be fed by hand through a semi-

circular paper path, with scanning lights and optics hidden behind the front panel. Scanned pages are ejected at the bottom; since there's no hopper, you have to catch them before they hit the desk or the floor. The handfeeding and -catching can get very tedious if you have a lot of pages to scan, but for the occasional batch, it's probably sufficient.

There is no way to open up the PC Scan to clear a paper jam, which could be a distinct disadvantage if you are working under pressure. Dest must have incredible faith in the integrity of the paper path, but I can easily imagine a piece of paper getting hopelessly jammed inside, which would require a service call from Dest. The lack of a mechanism to clear the paper path is one flaw in an otherwise superb hardware design.

INSTALLATION Unlike the Dest 212, which used a standard serial port, the PC Scan works with a special interface card.

OCR

Optical Character Recognition

Using a slot isn't so bad—but the three-quarter-length card could easily have been designed as a half-card to fit in a short slot (all that empty space and the 9-pin connector suggest that Dest has some future expansion in mind).

Six jumper blocks on the card let you set the direct memory access channels (1 or 3), interrupt level (3 or 4), and hex address of the I/O port. The jumper-block documentation is complete, easy to understand, and one of the few really technical aspects of the installation. In most cases the factory settings will be correct, and you will be able to ignore the jumper blocks. If you have expansion cards that use the same addresses, the PC Scan will fail its diagnostics and you will have to determine the DMA, interrupt, or hex address of the offending card.

Once you install the interface card, you connect it to the PC Scan with a 50-connector cable. Plug in the PC Scan, turn it on, and you're ready. The initial power-up diagnostics will display an error condition until you install the *Text Pac* software.

Text Pac can be installed on a hard disk or on two floppy disks. The software installation takes just a few minutes and is essentially a copy-initialization procedure that places *Text Pac* on a bootable disk (hard or otherwise). Once you install the software, you are ready to run the PC Scan.

SOFTWARE *Text Pac* runs in two modes: full-operation mode, which you use when your word processor does not require that you reboot the system to run it, and limited-operation mode, in which *Text Pac* may be loaded after a reboot. To understand why there are two modes, it is important to know how *Text Pac* works.

Most OCR software is self-contained: it sets up communications, handles font recognition, and inserts format codes within its own environment. You must leave the OCR software and run word processing software to edit the output file. Thus it makes little difference whether or not you reboot.

Text Pac is entirely different. Once the software is loaded, it stays resident in memory. To run it you call up your word processor and press a "hot key" (the default is Alt-S). A window pops up on

screen, prompting you to load a page. PC Scan then scans the page, recognizes the characters, formats the text, and places the output in the word processor file. You can press Alt-S while you're editing a file, scan in new text, then resume editing, all without leaving your word processor. This is its full-operation mode.

To install *Text Pac* on either the hard

The PC Scan's Text Pac software lets you scan in new text while working in your word processor. Top: in full operation mode with the RAM-resident Text Pac program loaded, you can pop up a scanning window during a WordStar session. Bottom: Text Pac's main menu gives you access to help files and allows you to quit to DOS.

disk or a floppy disk system, you simply create installation disks. If you must reboot the system to run your word processor, you must store part of the *Text Pac* software either on the system disk or in the word processing subdirectory. This is *Text Pac*'s limited mode, and it requires at least 21K bytes of free space. You must copy the remaining software onto two disks and

load it when the system prompts you.

When you install *Text Pac* the software asks if you changed the hardware configuration (DMA, interrupts, or hex addresses); if you have, you must enter the new values. Once you've copied the necessary files onto a working disk or a hard disk, you are free to change parameters as needed. For example, you can specify the default word processing program (*Text Pac* supports *DisplayWrite 3*, *MultiMate*, *WordStar*, *WordStar 2000*, and a universal word processing formatter), although you can change this at any time once *Text Pac* is installed. You can also change the default format parameters or the Alt key sequence that calls up *Text Pac*.

The manual contains specific instructions for using *Text Pac* and the PC Scan with each of the supported word processors. In some cases (like *DisplayWrite 3*), you must modify .BAT files before you start scanning. Most word processors don't require file modification, but it is useful to read the relevant sections to understand how *Text Pac* formats files.

Text Pac recognizes the standard range of monospace fonts (Courier, Elite, Letter Gothic, Prestige, Pica, OCRA, and OCRB) and proportional monospace fonts (Bold, Cubic, Madeline, and Title). The Dest documentation includes a two-page list of the type styles it supports; four additional pages illustrate the type styles for comparison.

Dest, like most manufacturers, does not support dot matrix fonts. A spokesperson for Dest told me that the next version of *Text Pac* will support fonts produced on Epson, Okidata, Star Micronics, Hewlett-Packard ThinkJet, and IBM PC graphics printers. High time, too—so many kinds of texts are printed with these fonts that I wonder how Dest or any of the other OCR manufacturers expect their machines to gain widespread use when they cannot scan the simplest font.

OPERATION To test the PC Scan and *Text Pac* software, I used my installation disk to load *Text Pac* software, entered the menu to select *WordStar* formatting, and then quit the menu to load *WordStar* (Version 3.3). After creating a file called PC_TEST.TXT, I pressed Alt-S to start scanning. *Text Pac* prompted me to insert

THE FAX ABOUT IMAGE SCANNING

PCs equipped with fax software can now communicate with those ubiquitous facsimile transmission machines.

I saw my first facsimile (or fax) machine in 1963 when I took a tour of the *Chicago Sun-Times*. Our guide stopped near the glass-walled Telex office and pointed out a fax as it was printing a sports photo from Los Angeles. I was amazed to think that someone could feed a photo into a machine in L.A. and it would arrive in Chicago a few minutes later.

In the old days, only wire services, the government, and the Fortune 1000 could afford to send images point-to-point along Telex lines. Two factors made fax affordable in the 1970s: the 1967 Carterphone ruling by the FCC, which made it legal to attach peripherals to telephone lines, and Japanese scanning technology. The Japanese had one important impetus for developing scanning technology: their language. Word processors have a hard enough time with the numerous Japanese ideograms; developing equivalent optical character reader capability should merit a Nobel prize. However, image scanning is well suited to transmitting the Japanese language, so they have invested a great deal of work in this area.

Today, over 800,000 dedicated fax systems are installed in the United States, and a growing number of PCs have fax capability. EIT's Personal Scanner 2000 and Tecmar's eSCAN offer special fax

software that allows a PC without a scanner to receive and edit images sent from a fax machine over phone lines. All of the systems reviewed in this issue follow the CCITT (Consultive Committee on International Telephone and Telegraph) standards for fax transmission compression. The CCITT standards are one reason why fax has remained a popular method for transferring images.

The CCITT has four group classifications based on the speed of image transmission. The first two groups are based on machines made in the 1970s: Group 1 transmits one page in six minutes; Group 2 transmits one page every 3 minutes. Group 3 equipment, which include most office PCs equipped with fax software, transmit one page per minute. This is the most common fax group standard in use today. Group 4 machines, which transmit pages in a matter of seconds, are not yet in wide use.

PC-based scanners use data compression algorithms to meet the CCITT standards for transmission. Most data compression involves eliminating the bits used to represent blank spaces, which often make up over 50 percent of the image data. One common compression method is to use only 1 bit to represent 4 bits of an image. The compressed file can be transmitted and then expanded at the receiving end.—**Tom Stanton**

a page, and the hardware immediately began feeding and scanning the page.

It took a minute for *Text Pac* to work past the letterhead, after which it scanned and recognized the monospaced characters in under 40 seconds. The price list, which had only monospace characters, took only 30 seconds to scan and recognize. The letter had only three unrecognized characters: when underlined, the words *every* and *by* have descenders that touch the underline. The letter was formatted more or less as I

wanted it, although I did have to reformat the third paragraph because *WordStar* did not wrap the words that contained the unrecognized characters.

The price list didn't format correctly at first; the tabbed text was scattered all over the page. A call to Dest's customer support revealed the problem: before you scan tabbed text, you should change the default *WordStar* ruler so that it is wider than the text you want to scan. This strategic tip isn't mentioned anywhere in the documen-

tation, but it should figure prominently.

Text Pac scans a page; determines the left margin, tabs, and right margin; and then embeds a ruler before dumping the text into the word processor. The documentation doesn't tell you that the *Text Pac* ruler cannot override *WordStar*'s default ruler (65 columns). In my case, *Text Pac* tried to embed a ruler but was overridden by *WordStar* every time, no matter what I did. Once I changed the *WordStar* ruler to 80 columns, *Text Pac* formatted the price list perfectly, right down to the decimal tabs. Random scanning of other pages produced equally successful results.

The concept behind the PC Scan—text scanning as a routine part of word processing—is an interesting one. For example, word processors with totally incompatible file formats can exchange data using the PC Scan and *Text Pac* software as the conversion utility. With *Text Pac*'s powerful formatting capability and its simple user interface, the PC Scan is a good choice for general-purpose OCR scanning. Best plans to add graphics scanning capabilities soon, which will be a welcome improvement.—*Tom Stanton*

▌Datacopy 730

The Datacopy 730 is an upgraded version of Datacopy Corp.'s 700 model scanner (see "Scanners at a Glance," *PC Magazine*, Volume 4 Number 14). Despite much new competition in the scanning market, the Datacopy 730 remains the premier low-cost scanner for the PC. The addition of text scanning features and enhanced graphics scanning resolution make the Datacopy 730 an even worthier competitor.

The 730 resembles a small office copier. Its 9- by 14-inch flat scanning bed has a flexible cover that can be removed when scanning books or magazines. During a scan, you place pages facedown on the glass and close the cover. A light source and scanning optics move beneath the page during a scan. Operator controls on the front allow you to adjust the light intensity to compensate for the quality of the scanned material.

Like most of the scanners reviewed here, the 730 has a special short-slot interface card that you must install before you can run the system. The card has two sets of DIP switches, but the documentation doesn't tell you much about them, except the I/O address space and DMA channel. Since the switches are set by the factory, and in the manual you are enjoined from changing them, I wonder why they are there in the first place.

You need a hard disk to install Datacopy's scan software and image-file subdirectory. Since a full-page scan image takes up over 500K bytes even when it's compressed, you cannot run the scan software as a standalone application on a floppy disk. (The OCR software and graphics editor can be run as standalones without the *WIPS* software environment described below, if necessary—for example, if you wanted to run them on a floppy system.) I would recommend a minimum of 10 megabytes for the 730 software and one or two other applications, such as word processing; 20 megabytes is probably more practical, but by no means a necessity. You can also install a mouse for menu control.

The 730 requires a Hercules Monochrome Graphics card or a compatible

(Everex or Quadram) to display the scan software. On one hand, the Hercules card gives you a full 700 by 350 pixels, which displays graphics far better than most systems. On the other hand, if you own an EGA card and compatible monitor you will have to reconfigure your system.

The OCR and graphics editor software will run on CGA or EGA cards and can be installed for these cards if you run them as standalone applications. However, to make full use of the software environment you need the Hercules card. If your other software doesn't run in a Hercules mode, you will have additional problems bringing it into the 730 environment.

SOFTWARE The Datacopy software, called *Word Image Processing System* (WIPS), has three component programs: scanning software, a graphics editor, and OCR software. When installed on a hard disk, the *WIPS* software creates a total computing environment. A menu utility lets you define the directory and the command to invoke other programs from within *WIPS*; so long as these programs run in a Hercules mode, the *WIPS* environment could replace other hard-disk menu utilities. The main *WIPS* Program Screen displays user-defined programs along with the *WIPS* options.

The Image Processing main menu displays options for image capture, image edit, scan parameters, image-file management (naming, loading, and saving), and printing. Submenus list additional options, such as merging text and graphics. The menu system is well designed and takes just a few minutes to learn. Cursor movement keys (or a mouse) move a highlighting bar from item to item in the menu; pressing Enter executes the item. User-definable options are enclosed in boxes, while commands are bracketed with lines. The Esc key recalls previous menus up to the *WIPS* Program Screen.

The scanning software offers a variety of options. You can select scanning resolution (240 or 300 dots per inch), the scanned image size (full page or portions of a page), image scaling (up to 200 percent of the original size), and image compression. One nice feature of *WIPS* is that it lets you scan, manipulate, edit, and size an image before saving it permanently to disk. Since

The versatile Datacopy 730 resembles a photocopy machine. This scanner is the only one in its price range that reads proportionally spaced text.

a full page of uncompressed data takes up over 1 megabyte, the ability to control what you eventually save to disk reduces the amount of time you spend managing hard disk real estate.

WIPS has two image-editing modes:

■ **The Datacopy 730's image resolution is excellent on-screen, and the zoom mode can show the minute detail of a portion of the image with even better resolution.**

on-screen within the *WIPS* menu, and the callable *WIPS* Editor. The on-screen editing mode lets you erase, invert, or rotate portions of an image defined with a window; this mode is useful if you want to work on large portions. For more control you must use the callable *WIPS* Editor, a modified version of Zsoft's *PC Paintbrush*. Like most "paint" programs, the *WIPS* Editor uses a mouse, pull-down menus, and a variety of brush widths, patterns, fonts, and drawing tools for manipulating the image.

The *WIPS* Editor does take a little getting used to because it uses aspect ratios to make the paint files compatible with *WIPS* image files. The aspect ratio in the paint program tends to stretch images so that, for example, a square is a tall rectangle and a circle an ellipse. This distortion makes it difficult to judge the effects of an image edit, but unless you plan a major overhaul of the image, it is probably sufficient for most cleanup work. You can also create images with the *WIPS* Editor by loading and editing a blank image page. You can run the *WIPS* Editor as a standalone program, but you cannot load any image files you create this way into the *WIPS* environment.

The *WIPS* OCR software is simple and effective. If somewhat clumsy in its imple-

mentation. You can set the page size, page contrast, type style, and output filename from the menu bar at the top of a screen. Three main options (commands, type styles, and settings) are highlighted with cursor movement keys or a mouse; pull-down menus display the selections in each option. Page formatting is *not* an option in the OCR menu; the text is received in one unformatted block, and you must run the file through page-formatting software as a separate step.

The OCR software has three user-selectable modes for dealing with unrecognized characters. You can continue without marking, in which case the software makes its best guess, or you can define a mark for unrecognized characters and mark each one in the file. The nicest option is stop and mark: when the software encounters a character it doesn't recognize, it pops up a window on-screen showing the word in which the offending character appears, much like a spelling program does. You can edit the word or ignore it at your peril.

INSTALLATION Installing the interface card and cable and connecting the 730 take just a few minutes. Your hardware configuration must be 100 percent compatible with the software's requirements; my attempt to load a Hercules emulation mode on an EGA card caused the *WIPS* software to crash when calling other applications. If you own a compatible, I strongly recommend that you have a salesperson demonstrate the system on your machine.

The *WIPS* Editor and OCR software are copy protected, allowing two installations per hard disk. You can remove protected files from one hard disk and transport them to another system. Software installation is easy enough, but the documentation ignores an important first step: you must install any mouse driver before you run the *WIPS* installation program. If you simply follow the steps in the installation guide, this fact surfaces only after you have entered the installation command, when it is too late to load the mouse driver. Mercilessly, the guide then asks you if you have installed the mouse driver. Bearing in mind that you are allowed only two hard disk installations, you must answer no, finish the installation, uninstall the pro-

gram, and repeat the procedure.

Once you're over that hurdle, the remaining installation is easy. The Menu Setup option in the *WIPS* Program Screen lets you define programs that *WIPS* uses as well as applications that you may want to run from the *WIPS* menu. You enter the application name, the extension (.COM, .EXE, or .BAT), and the path for each item in the menu. Before you run *WIPS*, you should modify your AUTOEXEC file and comment out all commands that load memory-resident programs, print-spoolers and RAMdisks included; *WIPS* uses all the addressable memory for manipulating images. I did not try uninstalling memory-resident programs, but my suspicion is that a simple Ctrl-Alt-Del reboot would be more effective.

OPERATION *WIPS* is easy to use and fast. It scanned and displayed the test 17th-century etching in under 2 minutes and the line drawing in just over 1 minute. It achieves this speed in part because *WIPS* does not write the scanned image to disk until you enter the save command. I liked its ability to scan, edit, and rescan an image until I achieved the desired look before saving the image. Other scanners write to disk as they scan, which takes longer and also means you need enough free space to do a what-if scan.

The image resolution is excellent on-screen, and the zoom mode can show the minute detail of a portion of the image

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with even better resolution. After I tested the samples, I scanned a number of other images, including black-and-white photographs and magazine ads (see sidebar "Take It to the Limit"), and was even more impressed with the 730's capabilities.

I scanned the etching several times, first in full screen and then using the WIPS windowing feature. You use the window to position the area to be scanned; although the 730 scans the whole page, it loads only the windowed area into memory. With a little practice you can window any area on a page, which is useful when you need only part of a picture and do not want to manipulate a megabyte and a half of image files. You can also use the window with the Zoom option; you can position and zoom in on areas to see if the detail has held up or if you need to edit the image.

Image scaling lets you enlarge the saved image. I tried several ratios to see which one I liked and found that the three-quarter size (2 to 1 ratio) looked best and held the detail. Too much reduction may cause tightly spaced lines to blend together; too much enlargement tends to reveal imperfections.

The on-screen editing feature, which also uses the window, could be considered the block mode for editing. Essentially, you select a block for erasure, reversal (black to white), or further editing with the WIPS Editor. I found this feature less interesting than I had expected. The image you select is stretched out of proportion because of the WIPS aspect ratios, which make the image twice as tall as it is wide. This distortion makes it difficult to estimate where and how much to edit. I'm not sure how much you can do with this feature if the original image is faded, blurred, or of poor quality.

Once I had edited an image I saved it in uncompressed mode: the 17th-century etching took 1.4 megabytes and the line drawing 850K. WIPS took 3 minutes to save the etching and a little over 2 minutes to save the line drawing. A counter at the bottom of the display shows you what percentage of the file is being saved, in 18 percent increments. It takes about the same amount of time to save files in compressed mode, but the file size is smaller. Recalling a file for additional editing takes over a

minute because the file must be loaded into memory.

TEXT SCANNING The OCR process requires two steps: scanning/recognition, then formatting the scanned text file. There are currently ten formatting files for word processing, including IBM's *Personal Editor* and *DisplayWrite*.

> When the Datacopy
> *WIPS* software encounters
> an unrecognized
> character, a window pops
> up containing the word
> and the character.

MultiMate, *Microsoft Word*, *WordPerfect*, *WordStar*, *WordStar 2000*, and *Volkswriter* (the Field Test documentation doesn't specify version numbers). Two other format files convert text line by line or by paragraph.

Its menu structure makes the WIPS OCR software easy to use; you can select fonts and settings and start scanning in under a minute. First I defined my unrecognized-character flag (the @ character) and scanned in the "mark-and-continue" mode, in which unrecognized characters are flagged during recognition. It took 30 seconds to scan and recognize each page; during the recognition phase, I counted a total of ten unrecognized-character flags for both sample pages.

The recognized text on-screen is a distressingly jumbled mass, but formatting the text will restore your faith. From DOS I selected the *WordStar* format file and entered the input and output filenames. The resulting output file displayed perfectly in *WordStar*, in both text and tabular format. The table was, unexpectedly, formatted with tab spaces and not hard spaces.

I scanned the text again, using the "stop-and-ask" mode. When the software encounters an unrecognized character, a window pops up containing the word and the character in a gray-scaled cell. At least, that's what the documentation says—in my experience, the window popped up and displayed the word; but the cell that was supposed to contain the character was empty. "Stop and ask" takes more time than "mark and continue": 3 minutes overall to scan two pages. I probably would use "stop and ask" only on a good-quality copy that I did not intend to spell-check. Datacopy has said that future OCR software will have a font-learning mode, and I suspect that "stop and ask" is an early part of that feature.

I ran the OCR software in standalone mode first. Once I was confident enough, I defined a WIPS menu selection (OCR) using a batch file that called the OCR software, then ran the formatter. With a little extra work, I could have incorporated a variable for the output filename. I wonder, however, why I had to bother doing this at all. The OCR software should have a menu setting for format software selection and do this work for you. Further, I would expect WIPS to integrate OCR into its menu as a default rather than making the user define all the options at the start. This is the weakest area in the package, particularly since all the other elements tie together so nicely.

TEXT AND GRAPHICS Once I had a formatted output file, I called *WordStar* from the WIPS menu and reformatted the first page. I had *WordStar* wrap the text around an open area 40 columns wide by 24 lines deep. WIPS provides several target marks that define the upper-left-hand and lower-right-hand corner for inserting images. There are three types of target marks: full size, "best-fit" autoscaling, and automatic cropping, all with or without aspect-ratio compensation. I selected autoscaling without compensation and inserted the target marks with the filename in the text. Once I filed the text, I returned to WIPS and ran the preview mode to see whether I had got it right (another nice feature).

You can merge a number of images with a single text file, so I layered the two samples one on top of the other in a second file. I then recalled the other image, windowed the quoin, and saved a third image file. My third merge included two sep-

arate files (the etching and the new quoin image file), using a newly formatted text file. Previewing all these variations was a real timesaver, because the third merge required a little work to get right.

Printing takes much longer than I expected. Using an Okidata 92, it took over 40 minutes to print just an image. The first sample of merged text/image took 35 minutes; the second took over 50 minutes; and the third took over 20 minutes. Laser printers undoubtedly print these files much faster and are also preferable if you want to achieve the best-possible resolution.

In spite of its kludgy OCR features, the Datacopy 730 is an exceptional system. Its ability to reproduce half-tones and manipulate images before storing them make this the hardware of choice if you want to scan the widest-possible variety of images. I liked the *WIPS* menus and the software's creation of a whole environment. A few weak spots notwithstanding, the Datacopy 730 is without equal in its price range.

—Tom Stanton

SpectraFAX 200

The SpectraFAX 200 is the only color scanner cannot do text scanning yet, but the company is developing OCR software that it promises will be available by the end of this year.

Later this year, SpectraFAX will also market a desktop publishing package consisting of a Bernoulli Box, the SpectraFAX 200 scanner, a modem, and a laser or thermal printer. This packaging plan brings up some interesting questions about how high-resolution (200-dot-per-

inch) color images can be used in telecommunications and in published materials and how scanners might be used in the future, when high-resolution laser printers will be able to print in color.

HARDWARE The SpectraFAX 200 is big: 10 inches high by 25 inches wide by 15 inches deep. Like many desktop copying machines, it has a flat glass plate on top, on which you place the image to be scanned. A covering lid that has the happy addition of "multijointed" hinges lets you scan images from books or magazines with a minimum amount of interference from external light sources.

On the front of the scanner are seven indicator lights for such information as power on and to let you know when the scanner is actually scanning red, green, and blue. The power-on switch itself, also on top, is refreshingly easy to reach. The scanner has only six circuit boards, and I understand that very few users have reported equipment breakdowns. Even so, SpectraFAX provides diagnostics software to dealers, enabling them to diagnose equipment problems easily.

Installing the SpectraFAX 200 is simple. You insert a half-size card in any PC expansion slot. A simple utility program must be run once to calibrate the scanner so that it sees color evenly. The documentation recommends that you run this program periodically to keep the scanner properly adjusted.

The 22-page manual clearly explains and illustrates the steps involved in installation and setup, as well as the scanning parameters that you set through a dialog box in *PC Paintbrush*.

The SpectraFAX 200 is the only color scanner reviewed here. Its large size may be a drawback, but if you need its unique capabilities, you'll make room for it.

SOFTWARE The SpectraFAX is designed to run with Zsoft's *PC Paintbrush*—in fact, the SpectraFAX installation manual itself is simply an insert to the *PC Paintbrush* manual. To scan a document, you select Scan from the *PC Paintbrush* Page menu. Inside a dialog box that appears on the screen, you specify the image size and location on the page, define the image as line art or "photo," set up an overall intensity level as well as individual values for shades of red, green, and blue, and set the scan for normal or reverse. Each color and intensity can have a value of 0 to 255 (or 256 different shades).

You need 500K bytes of disk space when scanning in the black-and-white mode, 2 megabytes when in color mode—hence the need for a hard disk system. We scanned in both modes, outputting the black-and-white scans to a 120-dpi Epson MX-100 (its low resolution makes it a proofing device at best). *PC Paintbrush* will soon release a laser version, and we'll be anxious to see the output at 300 dpi. For a color image, we scanned the cover of last year's issue featuring scanners (*PC Magazine*, Volume 4 Number 14). The scanner does one sweep across the image for each color, taking just over 2 minutes total. We output the color images out on a Canon PJ-1080A ink jet printer, which prints at only 84 dpi, but the results were stunning—the relatively low resolution of the printout was overshadowed by the beauty of the Canon's cyan and magenta inks.

Neither the screen version nor the printed version of our color scan showed exact-

We used the cover from last year's PC Magazine OCR cover story to test the SpectraFAX 200's color scanning capabilities. Left, the original cover; right, the scanned cover printed out on a Canon PJ-1080A ink-jet printer. The scanner sweeps the page once for each color; scanning the image above took about 2 minutes. You can manipulate the color settings to correct or change colors.

ly the same shades of color as the original, but you can manipulate the color settings so that the scanner sees colors differently. For instance, if the scanner doesn't seem to see yellow very well on the first try, you can increase the blue setting. Also, increasing the intensity adds depth to the colors scanned. Unfortunately, the current documentation for the SpectraFAX 200 and *PC Paintbrush* package contained no information whatsoever about color mixing, so we spent a lot of time experimenting, with mixed results. The company promises that a more helpful manual is on its way. Meanwhile, of course, you can still edit and manipulate the scanned images using *PC Paintbrush*'s tools and commands.

The SpectraFAX 200 is an excellent image scanner that seems reasonably priced, considering its color capabilities, even though it doesn't yet incorporate text scanning. The color capability itself, however, brings up an old issue: How useful is color, really, in a typical office environment? An obvious application is color overhead transparencies and slides for presentations. There's no question that companies that do a lot of video and slide production would benefit from the SpectraFAX's color scanning capabilities. Similarly, databases that can store and display color images—medical databases, for instance—will benefit tremendously from color scanning, especially when encyclopedias can be stored on CD-ROM.

Those of us who still need to print out mere pieces of paper must wait for drivers to become available for the 300-dpi black-and-white laser printers. Meanwhile, we'll

dream of the day when we can practically (that is, quickly, easily, and relatively inexpensively) print multiple copies of a document on a four-color high-resolution laser printer.—*Diane Burns & Sharon S. Venit*

Compuscan PCS 230

Compuscan has been in the OCR business for over 15 years, but until recently most of its products have been targeted at the mid- to high-range OCR market. For example, the Laser III FormsReader reads handwritten text as well as standard characters. The AlphaWord series can be used with personal computers but was aimed primarily at dedicated word processing systems like Wang and Lanier. With its introduction of the PCS (Personal Computer Scanner) series, Compuscan makes its first real foray

into the personal computer market.

The PCS base hardware consists of the scanner itself and various combinations of firmware or software. Compuscan calls these configurations "models," leading one to believe that three separate machines exist. In fact, the base hardware can be configured to act like all three models for under $7,000.

The PCS 220 configuration uses special plug-in firmware cartridges to produce formatted files for dedicated word processors like CPT, DEC, IBM, Lanier, NBI, Sideline, Syntrex, and Wang. The 220 is sold with one firmware cartridge (your choice), but you can swap firmware cartridges in and out so that one PCS can serve a number of systems.

The Compuscan PCS 230, for PCs and compatibles, uses software instead of firmware to produce formatted files from scanned text. Currently, the software can format files for IBM's *DisplayWrite 1, 2,* and *3*; *MultiMate*; *Samna Word*; *Volkswriter*; *WordStar* and *WordStar 2000*; and *WordPerfect*. (Compuscan plans to add other word processing software, but the spokesperson would not be more specific.) You can also scan straight ASCII text into a file and bypass the word processing altogether.

The PCS 240, which was slated for release in July or August, adds graphics scanning software to the existing capabilities of the PCS 230. The scanning software includes a modified version of *Dr. HALO II*. The scanner can be controlled from *Dr. HALO II*, according to company officials, which makes this package sound particularly attractive. You can purchase the PCS 230 and upgrade to 240 capability when it becomes available.

Compuscan announced a fourth model, the PCS 235, in June. The 235 is priced at $3,150 and has the same text scanning capabilities as the 230 but cannot be reconfigured to interface with dedicated word processors as a model 220 or to scan graphics as a model 240.

HARDWARE At first glance, you might mistake the well-designed PCS hardware for a high-end dot matrix printer. It has a low profile, a reasonable footprint, and convenient front-panel controls. The PCS holds up to 50 pages with a maximum

The Compuscan PCS 230 looks much like a dot matrix printer. Its input tray holds up to 50 pages, so large text-scanning projects are feasible.

length of 16 inches. A front cover opens to serve as an output tray during scanning; another cover protects the paper path and scanning optics but can easily be opened to clear any paper jams.

The back of the PCS holds a delightful surprise. In addition to a standard 25-pin serial interface and a socket for plug-in firmware cartridges, you'll find a 40-pin jumper block that lets you set up serial pin configurations. In most cases you don't have to do anything: the documentation gives you the standard configuration for a PC. However, if you find you need a special configuration, like crossing pins 2 and 3 or tying pin 20 to pin 7, you just rearrange the jumpers. This handy feature eliminates the frustration associated with building null-modem or custom-designed cables. Armed with a breakout box and the pin diagram in the documentation's Appendix II, you can connect the PCS to any serial device, including terminals and typesetters.

Two banks of DIP switches allow you to set formatting defaults and communications parameters. Switch 1 lets you set a "Best Guess" default that either flags all unrecognized characters with an "at" sign (@) or lets the PCS software make a best guess. Another DIP lets you ignore large areas of unrecognized characters or flag each character with @ signs. Other switches suppress tabs, formatting, underscores, and line-spacing defaults. Switch 2 sets bit-per-second rate, data, parity, and stop bits for asynchronous communications, or TTD and block-size parameters for synchronous communications.

The paper path for scanning is similar to that of a typewriter. Pages are drawn be-

tween two rollers and across the scanning window and then ejected at the other end. A stepped rubber wheel, similar to a ratchet, stages each page for scanning. As the scanner ejects one page, another is already entering the paper path.

Paper jams can be cleared easily. When you remove the platen cover, you expose the entire paper path. Two large knurled knobs, which can be loosened by hand, release the platen. Two additional latches that hold a pressure plate in place are pushed back, and the platen can be lifted out. Once you remove the jammed page, you can reassemble the platen and continue scanning. At worst, you may lose a single page of scanned text, but even this problem can be overcome by removing pages from the feed tray, feeding the errant page by hand, and replacing the remaining pages.

The PCS's scanning optics are similar to those of other machines. The line of scanned text is illuminated by a low-frequency red neon light, and the text is reflected toward the front of the machine and then to the rear where scanning optics focus the image on a charged coupled device that digitizes the characters. Recognition and formatting are handled by software.

Hardware installation takes only a minute or 2, and you'll spend most of that time connecting the PCS to a serial port and finding a convenient power outlet in your office. The PCS performs diagnostics on power up and, after a minute or so, gives you the green light to start scanning.

SOFTWARE The PCS 230 uses software to recognize and format scanned text. You can run it on a two-floppy system or on a

hard disk. The first step is to create an installation disk that contains the necessary font files and formatting software.

The PCS 230 recognizes most of the common monospace fonts, including Brougham 10, Courier 10/72 and 12, Elite, Esteem Pica, Letter Gothic, Pica, Prestige Elite and Pica, and Titan 10. It also recognizes some proportional typewriter fonts, including Bold, Bold Face, Bold Legal, Cubic, Madeline, Modern, and Roman. Like most scanners in its price range, the PCS 230 does not recognize true proportional typographic fonts—to handle those you'd need the Kurzweil 4000 or the Palantir CDP.

The PCS 230 also fails to recognize dot matrix type, a real limitation. Many kinds of texts—mail lists, customer lists, line listings, and computer-generated reports—are printed only in dot matrix, and it shouldn't be that difficult to devise font files that take low-resolution characters into account. Curiously, the old standby font for all scanners, OCRB, does not come standard on the PCS 230 (it is offered as an option). This is not a limitation, however, since nowadays very few people actually use OCRB.

Font files and formatting software must be placed on an installation disk. You type INSTALL and answer a series of prompts for the program drive, document drive, default word processing program, the COM port for PCS, and Compuscan scanner type (the software works with either the PCS or AlphaWord series). The documentation also gives instructions for special

PC FACT FILE

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word processing configurations (using *MultiMate, DisplayWrite 2* or *3*, or *Samna Word*) that require you to convert scanned files before editing. The other compatible word processors do not require the additional installation or customization. You must add the line DEVICE = ANSI.SYS to your CONFIG.SYS file (if it doesn't exist) and remove any other DEVICE = lines. Then reboot the system and you're ready to scan.

OPERATION Once you start up DOS, you can run the *Scancom* software at any time. If you have installed the software on a hard disk, you simply type CD \ SCAN and run the software; two-drive systems require you to run *Scancom* first and then convert or edit scanned files with a compatible word processor.

A setup sheet is scanned first to prepare the PCS. You load the remaining pages face down in the feeder and place a blank sheet where you want the scanning to stop. You can scan a number of different documents by separating them with blank pages; once the scanning stops, you can file the recognized text and then start scanning a new document. The automatic feed and blank-page separation features make the PCS 230 a good choice for medium-duty scanning in a production environment.

For simple scanning of ASCII text without formatting codes, you can use your favorite communications program or the simple communications program provided with the *Scancom* software (the set-up sheet loads this software). If you use your own communications program, load it and set it up for file capture.

When you're ready, type SCANPI and the filename, then press the start button on the front of the PCS. As it scans and recognizes each page, the text flows onto the screen. The *Scancom* software writes files to disk once scanning is complete; your communications program handles captured text as it would from any serial device. In both cases the results are much the same—a simple ASCII text file.

The PCS software really shows its stuff when it works with a compatible word processor. Depending on which word processor you chose during installation, scanning is either a one- or two-step process. For

Volkswriter, WordPerfect, WordStar, and *WordStar 2000,* you simply type SCAN and the filename. The PCS 230 scans the file and recognizes the characters; the *Scancom* software adds the formatting codes for you. The final file is ready to edit. *DisplayWrite 1, 2,* and *3; MultiMate;* and *Samna Word* require that the scanned files be prepared for editing. If you have a hard disk, the *Scancom* software automatically calls up the word processor and the correct menu to convert the files; if you have a floppy-based system, you have to load the word processor and select the file-conversion menu yourself.

THE FUTURE The PCS 240 software, which will add graphics scanning and editing capabilities, was not ready at press time. This was disappointing, since Compuscan's sales literature describes software that can "scan, size, rotate, move, edit, and annotate pictures, illustrations, diagrams, and line art, then electronically combine them with text without having to cut and paste." Compuscan had field-test software but was unwilling to show it to me.

According to Compuscan, the PCS 240 will use a parallel interface to send scanned images to the PC, and a modified version of *Dr. HALO II* will be bundled as part of the software. *Dr. HALO II* lets you manipulate graphics. Integrating the text and graphics is another matter; this will probably be accomplished through *Scancom* by adding a software "hook" into the word processing code.

The PCS 230 is easy to install and operate. Except for its lack of dot matrix font recognition, it is the consummate midrange text scanner for the office: automatic sheet feeding, a simple paper path, and formatting of scanned text are all standard features. When graphics scanning and editing software is added, the PCS is likely to become a major contender.

—Tom Stanton

Compound Document Processor

Last year I was bowled over by the Kurzweil 4000 Intelligent Scanning System, which did something I hadn't seen any optical character reader do before—

scan and recognize proportionally spaced typeset characters. The 4000 can be trained to recognize a number of type styles within a document and, once trained, can scan documents in production mode with a throughput rate ranging between 20 and 50 seconds per page. With additional hardware it could also scan multicolumn text. Its high base price—$36,500—mattered little compared to what the 4000 offered (see "The Kurzweil 4000: A State-of-the-Art Reader," *PC Magazine*, Volume 4 Number 14.)

The Kurzweil 4000 is no longer alone in its price/performance category. A formidable challenger that is smaller, faster, smarter, and competitively priced has stepped into the ring: Palantir Corp.'s Compound Document Processor (CDP).

Palantir (not to be confused with the software company of the same name) is new in the scanner field. Its press kit sounded too good to be true, claiming that the CDP could scan simple pages, multicolumn pages, and most of the common fonts in type sizes from 6 to 28 point—with or without graphics—in 8 seconds. It could then recognize the scanned characters and format them (multicolumn or simple galley) in under 60 seconds for an average text document (slightly longer for compound documents). What made the Palantir CDP sound most remarkable was that it did all this automatically, without being trained first by an operator.

HARDWARE On the surface, the CDP is disarmingly simple: a long box (13 by 16 by 27 inches), with the scanner optics and paper handling at one end and the connectors at the other. The front panel has a two-line LCD display and four operator buttons. Besides setting communications parameters and scanning density, you can select scanning options based on the format or characteristics of whatever text you're scanning. You can select vertical or sideways scanning; alpha only, numeric only, or alphanumeric scanning; ragged left, ragged right, centered, or justified text formats; and multicolumn page-image format (where column formats are kept intact) or galley (where columns are stripped into a single column). The CDP offers so many options and combinations that the only problem is choosing among them.

Above the controls is a 50-page feed tray that accepts documents from 3 by 5 inches up to 8½ by 14 inches; below, an exit hopper neatly collects the scanned documents. The paper path feeds pages straight across rollers from top to bottom and has an access door that you can use to clear paper jams. The CDP illuminates and scans each page, focusing the image onto a charged coupled device at the rear of the machine. The scanning resolution is 300 dots per inch.

Most OCRs process a character or a line at a time. The CDP achieves its high scan rate by dumping an entire page image into 2 megabytes of on-board RAM for processing. The board's recognition engine includes five Motorola 68000s, 1 megabyte of additional RAM, and 1 megabyte of ROM. All character recognition is done on the CDP; the host system has only to accept the ASCII stream or bit-mapped page image.

The CDP can use one of three communications interfaces to a variety of hosts: standard serial (RS-232) or optional Ethernet or Multibus. Unlike the Kurzweil 4000, which requires its own computer system, terminal, and mass storage, the CDP can take advantage of existing host resources running UNIX or DOS. I saw the CDP run on two different machines: the first, a Sun workstation running UNIX, could display a whole page at a time and showed the formatting and bit-mapped graphics to their best effect.

The CDP was then connected to a PC AT with a high resolution (1,280 by 800) Wyse WY-700 monitor (see "DOS Meets the Workstation," *PC Magazine*, Volume 5 Number 11) that requires its own interface board. The WY-700 screen cannot display a whole page of formatted text at a time, but it can display compressed graphics if they fit in the 640K-byte workspace. Although you can use an EGA or CGA board to process text, neither of these video standards has the necessary resolution to display the graphics.

This in itself does not put the CDP out of reach for PC users. James Landerkin, who runs Palantir's Rockville, Maryland, office, pointed out that five ATs connected to a CDP on Ethernet could take full advantage of the CDP for under $8,000 per PC. This is comparable in price to mid-range, single-user scanners that have a third the scanning capacity. The graphics could be handled by one or two PCs outfitted with the necessary high-resolution boards, or by a single workstation.

SOFTWARE The CDP takes the page image stored in RAM and performs two operations. First, it separates text from graphics on the page image. Then it compresses the page image, including any graphics, to CCITT Group 3 or 4 facsimile standards for storage or to be sent to a host system for further processing.

The text is converted to ASCII format using patented font-recognition algorithms. According to Palantir's president, Daniel Macuga, the algorithms are not based on either matrix matching or feature recognition—the two traditional methods of character recognition. Matrix matching limits the size and style of the characters you can scan; while it is accurate, it tends

The box that holds Palantir's CDP is deceptively simple. This text-and-graphics scanner is packed with sophisticated capabilities.

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to be slow. Feature recognition can scan most sizes and styles, but it requires operator intervention when it encounters exceptions, such as a broken character or stray marks on a page.

Palantir would not comment on the algorithm at all. My best guess is that the CDP algorithm uses a combination of both methods: a form of matrix matching to verify the basic character shape and feature recognition to confirm the decision. According to Palantir's press literature, "A single character reference ('I', 'P', etc.) represents multiple type fonts." This phrase suggests that as a page image is dumped into memory, one software routine decodes the bit stream, strips the font features, and performs some form of matrix matching to determine the basic character shape. A second routine takes the same page image and performs feature recognition. The two routines compare results and produce the ASCII stream. This might be done in two steps or in parallel; however it is done, the final result is character recognition.

I'm basing my speculation on two points: First, the CDP has some difficulty with tightly kerned text, where letter spaces are very small or nonexistent; occasionally it cannot separate the two charac-

ters and flags them. Second, the CDP separates text from graphics *before* it performs recognition, which suggests that the bit image is decoded according to the density of dots (low density for text, high density for graphics).

The CDP backs up character recognition with spell checking and context checking. The spell checker flags characters and checks them against an 80,000-word dictionary. The algorithms are strict, and so the CDP may flag characters even when they are spelled correctly; to this end the operator can run it in a "loose" mode, in which flags appear only when the CDP is very unsure, or in "tight" mode, in which the CDP displays all flags.

Context checking further verifies words when the CDP spell check is not enough. For example, the word *MAgazine* would convert to *Magazine* because most English language words do not start with two capital letters. Similarly, the CDP may scan the word *little* as *1ittle*, but convert it back to *little* because no word begins with a number. Conversely, context checking recognizes that the string "$100.00" is "$100.00" because numbers rarely contain letters. The operator can turn on an alphabetic or numeric mode, depending on the document, to enhance verification for

each type. The CDP might flag a lot of characters in mathematics texts, where letters and numbers are intermixed freely.

Character flags are embedded in the text, while the CDP sends along its best guess based on its extensive checks. The software allows an operator to choose whether to display flags or not, and a single key can be programmed to search for the flag and delete it, leaving the cursor on the flagged word for editing.

THE DEMO Because it does not sell the CDP directly to users but markets it through other companies, Palantir would not send us a review unit but invited us to the Rockville, Maryland, office for a demonstration. I arrived armed with my samples, prepared to be disappointed. I left impressed, especially because the press kit turned out to be relatively modest in its claims. The CDP was first connected to the Sun workstation. Everyone was quick to point out that the CDP did all the processing and that the Sun was used only to show the full resolution of the scanned image.

After we ran through the available operator controls, which you input via the front panel by pressing a combination of four buttons, we loaded a stack of samples into

This detail from Palantir's brochure for the CDP (left) was scanned and then printed out on a laser printer (right). The time required to scan an image like this one is short—about 8 seconds—but printing out the image can tie up the printer for 45 minutes or more. You can get good low-resolution images on a PC AT, but for really high-quality images you'd have to connect the CDP to a Sun workstation.

YOUR PC WANTS YOU
TO GIVE IT THE SAME ADVANTAGE
YOU GIVE YOUR TAPE DECK
AND VCR.

It's only fair. Not to mention logical. PC's want to perform as well as all your other sophisticated electronic equipment. If you're like millions of informed people throughout the world, you rely on the ultimate in audio and video recording performance. You rely on TDK.

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So, if you want to put a smile on your computer's face, choose from TDK's family of 5.25-inch standard, 5.25-inch High Density and 3.5-inch No-Risk™ Disks. It's to you and your PC's advantage.

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the sheet feeder for scanning. The samples ranged from a simple business letter to a complex page from a journal, with three different columnar arrangements and several font sizes and styles.

The Sun displayed the scan time for each page, which averaged about 8 seconds. The processing time varied from a few seconds for a simple format to 70 seconds for the most complex page. After a scan, the system processed each page image, and I compared the printed page to the screen image on the Sun, which displays one type size per page, based on the page image size. A simple letter is displayed with larger characters while two- and three-column pages are displayed in a much smaller size.

All the samples displayed perfectly and were formatted, line for line, identically with their printed sources. For example, one of the multicolumn samples was deliberately printed so that the lines in the first column were not even with those in the second column. The CDP dutifully formatted the page with the misalignment intact. It formatted the next sample, in which the columns did line up, line for line. The samples I provided were anticlimactic: the CDP scanned text and graphics with little effort. The only errors were the underlined characters, which the CDP flagged (as did all the scanners I tested).

We tried random pages from *PC Magazine* to see how they would scan. The Print Looks opening page presented some interesting problems. The page had eight different fonts, reverse type, halftone photos, color, and tightly kerned 9-point type in two banks of four columns each. I don't know of a single scanner that could scan, recognize, and format this kind of page without a great deal of effort. The CDP did its best and was pretty successful. Reverse type cannot be scanned, and so the CDP ignored it in text mode. The two headlines were over 28 points, and so it converted them to graphic images. The CDP scanned and recognized subheads and text, although the small italic page captions caused a few characters to squeeze together. Nevertheless, the final result on screen approximated the page, including the columnar format and text runarounds, and at least 85 percent of the characters were scanned and recognized correctly. Here's

the kicker: the CDP did all this in under 2 minutes, with no training and no previous input. It even tried to scan and recognize a line of type printed sideways outside the page box.

I then tried page 118 from last year's *PC Magazine* cover story on scanners (Volume 4 Number 14). For this page, which was more typical of the kinds of magazine articles that would need to be scanned, the CDP scanned and formatted all three columns plus the page number and footer in under 80 seconds. We switched to the graphic image of the page to see how it looked. At 300 dots per inch it looked better than a typical photocopy, which tends to drop out gray areas and solarize an image into massive areas of black and white. The CDP image was so good that we could easily read the Dest logo above the page header.

GRAPHICS The CDP scans graphics at 300 dots per inch. The results on the Sun were impressive, but even on the PC they were better than you would expect. The CDP can compress graphics into Group 3 or Group 4 (CCITT) facsimile standards for transmission. Graphics editing and text/graphics merge software are not included with the CDP, but most workstations are equipped with the necessary software.

Since PC AT users have to contend with limited memory and a lower-resolution screen, graphics must be displayed in a compressed mode to fit within the 640K-byte workspace. So far, Palantir has not tried to use either expanded or extended memory for graphics displays, in part because images must have contiguous memory. Even if you could fit a full-page image into memory, few displays for an AT could match the Sun (or any other workstation) for resolution. With the smaller screen, you must scroll vertically or horizontally to see the entire image.

A MATTER OF FORM The Palantir folks showed me something the CDP can handle that most scanners tend to avoid: forms processing. The CDP software allows you to define 256 zones for selective scanning of a page. You scan the desired form and display an image of it on the workstation. This image is a compressed

version of the bit image but is more than acceptable for defining scan areas. The CDP defines a home position on the bit image of the form and then lets you specify areas with a mouse. The areas used in the demonstration included a name, address, phone number, and signature line. I dutifully signed my name, and the image was scanned. Based on the user-defined areas, the CDP scanned the form but ignored all other data and converted only the defined areas into ASCII text. My signature was converted into a graphic.

You can define certain areas as rotated (in 90-degree increments) so that the CDP can also scan form numbers that are printed vertically. User-defined areas are stored along with the bit image of the form, so that when you scan additional forms you don't have to redefine the areas unless you need to make a change. To demonstrate forms scanning, the Palantir staff ran a demo created for a previous customer on some Federal Express airbill receipts with user-defined areas. With one exception, the CDP scanned each area perfectly. The exception was caused by fuzzy letters on the form (we weren't scanning the originals, but carbon copies—that in itself is more than most OCRs can do).

Palantir's forms handling alone gives the CDP a marketing edge. None of the other scanners reviewed in this issue adequately handles forms; if they handle them at all, they perceive them as an ASCII doc-

ument and have no capacity for selective scanning of fields. The CDP does not go so far as to format data from forms to be merged into databases.

FAULTS The CDP is not flawless by any means. It shares many of the usual scanner handicaps, notably a difficulty with letter ligatures and tightly kerned type and an inability to adequately scan and recognize a string of vertical characters like "ill," which it may read as "111." The density adjustment can compensate for some of this, but even with spell checking and context checking, the CDP cannot ensure 100 percent perfect recognition.

At present, the CDP does not differentiate type sizes or styles: all recognized text is converted into a straight ASCII stream without style attributes. The operator must add whatever the CDP stripped out, which may entail a great deal of work if you use the CDP for desktop publishing. Palantir plans to introduce additional software to handle the size and attribute problem.

Most of the midrange scanner manufacturers have settled for limited-capacity scanning of monospace text and have added graphics scanning as an enhancement. These products fill a narrow and specific need in some offices but are not adequate for general-purpose scanning. The Kurzweil 4000 offers considerably more but requires a trained operator and a dedicated computer. It has answered the needs of real power users, such as publishers, but is too esoteric for most business use.

Palantir's CDP fills the gap. It is as easy to use as the lower-priced scanners and has the power of a Kurzweil 4000. More important, the CDP was designed for the office—with text, graphics, and forms handling built into the system. This is the first scanner I've seen that actually fulfills the promises scanner manufacturers made when the earliest models debuted over 20 years ago. It can scan and recognize any printed page, or selected portions, and deliver the contents to the host as desired. The graphics scanning is more than a hook into publishing; scanning signatures, photos, or other pictorial information for databases is not far off. In tandem with a WORM (Write Once Read Many) CD-ROM, the CDP could be a cornerstone of any automated office.—Tom Stanton

The Common Dilemma

Apparent Solution.

The Two FACES of IBM's 8-MHz AT

Is the new 8-MHz IBM PC AT an already-outdated latecomer to the high-speed market, or is it the most desirable 80286-based machine available? The truth is in the eye of the beholder.

I
BM's new Personal Computer AT, with its 8-MHz clock speed and 30-megabyte hard disk, is like a straggler arriving late at the party, a little mystified that nobody is paying much attention. This machine was outmoded even before it was available. It runs no faster than a 6-MHz IBM PC AT whose crystal has simply been switched and is now outclassed by more-interesting and cheaper machines from manufacturers who see 8 MHz as a starting point rather than an upper limit.

The new PC AT, like the old one, has only a paltry 512K of memory on its system board when there is plainly room for 512K more. Many AT-compatible machines have at least 640K, if not 1 megabyte, on their system boards. Typically for an IBM product, the new AT displays design timidity and lack of innovation. It is IBM's latest attempt at putting a cap on the processing power it is certainly capable of building into a machine.

That's one way to look at it.

On the other hand, the 8-MHz PC AT is now IBM's top-of-the-line personal computer. It is thus the best AT-compatible available and the only sensible one to buy.

WHERE IT STANDS In fact, both of those descriptions are correct. Anybody who is considering purchasing a PC or AT has to make a difficult decision: to buy IBM or go with a compatible. If you decide to buy IBM, you are not basing your decision on performance, features, or price.

On all tests that measure processor speed, the 8-MHz PC AT clocks in about 33 percent faster than the older 6-MHz AT, as you can probably guess by dividing 8 by 6. This simple 33-percent increase reveals that the AT hardware is still inserting one wait state into system-board memory accesses. The memory chips on the system board are rated at 150 nanoseconds.

The speed of floating-point calculations using the 80287 math coprocessor also shows a 37 percent increase in speed, which indicates that IBM is still using the shortcut method of wiring up the 80287. The 16-MHz crystal in the new AT runs the 80287 at one-third the crystal speed, or 5⅓ MHz. (The 80287 in the older 6-MHz AT ran at 4 MHz, one-third the speed of the 12-MHz crystal. The 80286 microprocessor runs at half the crystal speed.)

Disk speed comes in about the same as that of a 6-MHz AT, which is also not surprising. Although we did not receive any technical reference for the new AT, its BIOS reports that the AT's 30-megabyte hard disk has 732 cylinders, 17 sectors per track, 512 bytes per sector, and five heads. The cluster size (also the minimum amount of space allocated for a file) is 2K.

"IMPROVED" KEYBOARD When you buy a new XT or AT these days, the moment of truth will come when the salesman asks, "Do you want the new keyboard or the old keyboard?"

The IBM Enhanced Personal Computer Keyboard is IBM's latest attempt to design the perfect standard keyboard. IBM is

■ The most welcome keyboard change is the separation of the cursor keys from the number pad.

strongly indicating that this keyboard, which was unveiled along with the PC RT, will be the standard for future products. Even a machine as different as the laptop IBM PC Convertible has a keyboard based on the same layout.
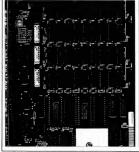
The new keyboard is definitely maddening at first. To drive *WordStar* users insane, the CapsLock key is now located where the Ctrl key was once found. To drive *MultiMate* users insane, the function keys are now stretched across the top of the keyboard. IBM has added two new (for the PC) function keys: F11 and F12. Two Ctrl and two Alt keys flank the Space bar. That

problematic Esc key has been moved back to the top left of the keyboard, near the function keys. One-key Pause and PrtSc keys sit to the right of the function keys.

The most welcome change is the separation of the cursor keys from the number pad. The number pad includes duplicated Plus, Minus, multiplication, division, and Enter keys. The cursor movement keys are arranged almost in a diamond pattern.

The new keyboard has been designed to minimize software incompatibility problems that could result from a separate cursor pad. When NumLock is on, the cursor-keys generate scan codes that make the keys appear to be combinations of the Shift and the cursor keys on the number pad. When NumLock is off, the cursor keys generate the same scan codes as the number-pad cursor keys.

However, programs that grab the hardware keyboard interrupt and attempt to do

The new AT's system board is reorganized but similar to the old. Its two banks of 256K-bit memory chips (right) provide 512K bytes of memory, but there's clearly room for 512K bytes more. Banks of 128K-bit chips crowd the old AT's system board (left).

their own key processing may run into a few problems. I couldn't get *XyWrite II* to use the separate cursor keys and number keys correctly unless I entered the program with NumLock on. *Microsoft Windows* didn't seem to have any problems until I tried to block out text by shifting the cursor keys. However, if you run into problems, you can always go back to using the number pad for cursor control, just as you do now. From the software's perspective, the number pad works the same way as it always did.

Programs that use the BIOS for keyboard information should have no problems using the separate number and cursor keys. This keyboard is just one more lesson that demonstrates to programmers the advantages of using the BIOS rather than directly accessing the hardware.

With this understood, how can programs use the F11 and F12 keys through the BIOS? They can't. The F11 and F12 keys generate hardware scan codes (specifically 57b and 58b), but the BIOS ignores them. A program that wants to use F11 and F12 has to grab the keyboard interrupt.

The feel of the new keyboard is a little mushier than the old PC and AT keyboards', but not nearly as mushy as that of a typical clone keyboard. On most clone keyboards, it's never quite clear whether you're typing or making mudpies.

I could get used to this keyboard. I could even learn to love it, however reluctantly. I have the uneasy feeling IBM is telling me, "You'd better learn to love it, because this is the keyboard of the future. Our decision is final."

You're not trapped yet, however. The best thing about the new keyboard is that, as I said for now, it's an option. The old one is still available. I tried plugging an old AT keyboard into the new AT, and it worked just fine.

INTERESTING ALTERNATIVES

IBM's 8-MHz PC AT is not the machine for you if you want high performance at a low price. More-interesting, more-compact, and less-expensive ATs are becoming available from other manufacturers. Several of these new AT compatibles have recently passed through *PC Magazine Labs* and have proved quite impressive.

The PC's Limited 286 12 (*PC News*, page 33, *PC Magazine*, Volume 5 Number 13) is certainly a marvel. With a hard disk, the 286 12 costs just $3,590, about $1,700 less than the new IBM PC AT. That's significant enough, but this machine also runs at 12 MHz (50 percent faster than IBM's 8-MHz PC AT), has a 40-megabyte hard disk drive (33 percent bigger), and 1 megabyte of memory on the system board (twice as much as IBM's AT). It's also 20 percent smaller than the AT. A unique status panel on the front tells you which disk track is being accessed and indicates if you've crashed your machine.

The Toshiba T3100 (*PC News*, page 33, *PC Magazine*, Volume 5 Number 13) is another attractive alternative. The T3100 costs $4,499 and has an 8-MHz

A faster clock speed is one of the few changes in the new AT. Its 16-MHz crystal (right) runs at 8 MHz; the old AT has a 12-MHz crystal (left).

80286, 640K of memory, and a hard disk drive, albeit only a 10-megabyte one. The T3100's truly distinguishing feature is its size: it's a 15-pound laptop with a very readable plasma display.

With these options and many others available, who would even consider buying an IBM 8-MHz PC AT? Many have, and many will. Even people who have suffered AT hard disk failures, as have been disappointed by such IBM releases as the *PCjr* (and its reincarnation, the Convertible), who believe IBM is deliberately cramping the AT's potential so as not to compete with its own line of minicomputers—even people who genuinely hate IBM will still buy IBM.

Sound crazy? Not at all. Buying IBM implies that you recognize differences that go beyond performance, features, and price.

WHY IBM?

Like it or not, IBM calls the shots in this market. The hardware standards that have come about without IBM's endorsement (the Hayes modem, the Hercules Graphics Card, the Lotus/Intel/Microsoft Expanded Memory Specification) are so few that they prove the rule. Half-a-dozen color/graphics boards attempted to improve on the CGA, but they went nowhere until IBM introduced the Enhanced Graphics Adapter and set the new color video standard.

IBM makes the originals, and everything else is a copy. A compatible's ROM BIOS must be different from IBM's, or its manufacturer will get a letter from IBM's lawyers. However, deviations from IBM's design—even in the form of improvements—can mean incompatibilities.

The three big lies of the personal computer market are "We'll be ready to ship next week," "Our tech support is excellent," and "It's 100 percent IBM compatible." One-hundred-percent compatibility does not exist. The truth is that only IBM is 100 percent IBM compatible, and incompatibilities exist even between IBM's own PC, XT, AT, PCjr, Portable, and Convertible. Manufacturers of compatibles can honestly claim only that their machines run the programs they've tested. That claim does not mean they run everything.
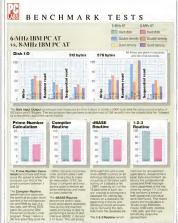
I'm not talking about Lotus's *1-2-3* and *Flight Simulator*. Nobody will ship a compatible that does not run these programs. I'm talking about things like software you got from your bank to do home banking over your modem. Your bank can't help you. The manufacturer of your compatible can't help you. You're stuck.

Peripherals can pose tricky problems for compatibles as well. Nobody, after all, has ever written a letter to PC Tutor that began, "I have an IBM PC, an IBM Graphics Printer, and an IBM Color/Graphics Adapter, and I can't get them to work right together."

IBM's PC and AT have been characterized by conservative hardware design. Although the original AT was certainly capable of running at 8 MHz rather than 6 MHz, IBM decided to curb it at 6 MHz. But the very fact that it was capable of running faster means that margins have been built into the design to ensure greater reliability. A manufacturer of an accelerator board once told me that the IBM PC bus timings were so conservative that his engineers were able to cut corners all over the place to get more speed out of the machine. I believe it, but this particular accelerator board was about as stable as a drunk on a high wire.

Manufacturers of compatibles are able to come closer and closer to IBM's hardware and BIOS, and they continually make adjustments as they learn how much they can change things without becoming incompatible. Many compatible machines can now run off-the-shelf PC-DOS. (Runing BASICA, which comes with PC-DOS, is still a problem since it uses a version of BASIC in ROM on IBM's system board.)

However, even the subtlest differences

may cause problems in the future. As the EGA takes over as a video standard, for instance, we are likely to hear reports from people who can't install an EGA in their older clones. If you have an old IBM PC with the original BIOS, you can't install an EGA—but you can get a replacement BIOS from IBM. Can you get one from the manufacturer of your clone?

Buying IBM ultimately means playing

it safe. Think of the logo plate on the front of the case as a little insurance policy. Of course, some people get along fine without insurance, and others simply can't afford it. For them, the market is full of alternatives that will easily outperform IBM's new PC AT.

Charles Petzold is a contributing editor of PC Magazine.

BENCHMARK TESTS

6-MHz IBM PC AT vs. 8-MHz IBM PC AT

The Disk Input Output benchmark test measures the time it takes to create a 200K-byte data file using record lengths of 512 bytes and 578 bytes. The first program then performs a random read of 256 records from the created data file, followed by a sequential read of the same records.

Prime-Number Calculation

The Prime-Number Calculation benchmark test measures the speed at which the computer can find all the prime numbers between 1 and 10,000.

Compiler Routine

The Compiler Routine benchmark test processes the speed of program development in the microprocessor and the RAM by way of a two-step, self-timing DOS batch file using the IBM Personal Computer Linker program. Stage 1 takes a 341-line assembly code file

(.ASM), converts it to binary code, and links adds it with other binary files to make an executable (.EXE) file. Stage 2 compiles and links source code to resolve address references and make an executable file.

dBASE Routine

The dBASE Routine benchmark test for database applications assesses how quickly the machine reads and writes to disk by performing a series of disk-intensive dBASE II Version 2.41 tasks. The self-timing

DOS batch file runs a total of six dBASE routines on 50 individual database records consisting of 64 bytes each working on a database file (.DBF), indexing on 2 of the 10 fields in each record, copying to a temporary database file, sorting two indexes on a database file appending a record, and deleting a record and packing (or removing the data from the database file.

1-2-3 Routine

The *1-2-3 Routine* benchmark test for spreadsheet applications, designed for a large byte environment, assesses the computational speed and RAM management capabilities of the machine by using a 7-by-2 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-cell range 499 times, moves 1,000 cells, deletes 1,000 cells, and then systematically clears the spreadsheet.

The new 8-MHz PC AT is, predictably, about 33 percent faster than its 6-MHz predecessor. Lots of turbo-charged competitors can easily beat these times, but the new PC AT offers one thing they can't beat: the IBM logo.

The most significant development in monochrome graphics since the Hercules Graphics Card.

Announcing the Hercules Graphics Card Plus.

Four years ago, the Hercules™ Graphics Card brought high resolution monochrome graphics to the IBM® PC for the first time. And revolutionized the world of personal computers.

Now, it's happening again.

Because now there's the Hercules Graphics Card Plus. A giant step forward in technology that creates a whole new standard for graphics hardware and a world of potential for software.
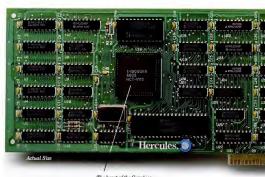
Three modes are better than two.

Until now, graphics cards have had only two modes to work with: text and graphics.

Text mode is very fast, but it's limited to 256 pre-programmed characters.

Graphics mode, on the other hand, lets your software create as many characters as you want. But for text processing, graphics mode can be slow, painfully slow.

Enter a new, third mode.

Called RamFont.™

Two years in development, RamFont gives you the best of both worlds. It blends the blinding speed of text with the flexibility of graphics.

Actual Size

The heart of the Graphics Card Plus: the V112 microchip, Hercules' next generation video processor that makes the RamFont mode possible.

Hercules.

Enough flexibility to blow the doors off the 256-character limit of text mode.

Because RamFont can handle an astonishing 3072 different characters of various widths and heights.

Instead of 256 canned, unchangeable ones.

The future according to RamFont.
With all these characters and fonts to work with, software will never be the same again.

RamFont word processors, for example, will put italics, boldface, and scientific characters right on the screen with standard text. So you can see what you're about to print.

RamFont spreadsheets will use smaller characters to display larger amounts of information. So you

The Hercules Printer Cable— a $40 value, free with each Graphics Card Plus.

can get the big picture.

RamFont integrated packages will mix true text and graphics and turn your PC's screen into a fast-lane version of the Macintosh.'s™

And if you happen to be one of those geniuses who's fluent in five languages, you'll be able to type a letter in all of them.

Simultaneously.

A Herculean feat.
How did we manage to combine the radical new RamFont on the same card with Hercules' legendary sharp text and high resolution 720x348 graphics and still be 100% compatible with the original Hercules Graphics Card?

It wasn't easy.

In fact, it took two years and all of the sophisticated CAD tools at our disposal to create our exclusive V112 microchip.*
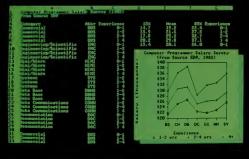
This totally new generation of video processor is at the heart of every Hercules Graphics Card Plus.

It's also at the heart of a revolution in software that's beginning right now.

Turn the page and you'll see what we mean.

Patent applied for.

Another Hercules innovation: the new LPT112. It's a parallel printer port on a chip.

Lotus 1-2-3 Rel. 2 in the RamFont mode of the Graphics Card Plus: fast scrolling, a 90-column by 38-row screen and a pop-up graphics window.

Software will never be the same again.

The trouble with most new hardware introductions is that there isn't any software available to introduce them to.

Not so with the new Hercules Graphics Card Plus.

It runs everything the original Hercules Graphics Card runs.

Better yet, it comes complete with the software you need to start using the revolutionary new RamFont mode right now with some of the world's favorite programs.

Lotus blossoms.

Of course, if you want to talk about the world's favorite programs, you have to start with Lotus 1-2-3.

You won't recognize Release 2.

Because now you can put nearly twice as much information on your screen, scrolling right and left and up and down at speeds you'll remember nostalgically from the days of Version 1A.

Another thing you won't recognize is that cute little graphics window. You can thank RamFont for that.

Now that RamFont is with us, you can pop up a graphics window any time you're in the mood and still keep your 1-2-3 spreadsheet in the background.
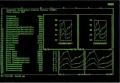
And you can do the same with Symphony," of course.

Or, if your tastes tend toward Ashton-Tate's Framework™ II, you'll be pleased to hear that you can really

The Graphics Card Plus in RamFont mode showing multiple fonts created using FontMan,™ a Hercules program that comes free with each Card.

Ashton-Tate's Framework II with italics and boldface and speed in the RamFont mode of the new Hercules Graphics Card Plus.

The programmable RamFont is so flexible, Symphony can mix true text and graphics.

Microsoft Word in RamFont mode: italics, boldface and small caps—plus speed and lots of it, at last.

burn rubber with its word processor.

The revealed Word.

Speaking of word processors, remember a couple of pages ago how we said they would be forever changed? Well, the change has already begun.

For example, the Hercules Graphics Card Plus with RamFont makes Microsoft® Word a whole new program.

Suddenly the italics, boldface, superscripts and subscripts scroll superfast. Which means you don't have to twiddle your thumbs waiting for the screen to catch up with your fingers.

More to come.

As time goes by, more and more major programs will take advantage of the extraordinary capabilities of RamFont.

Which gives you two choices.

You can buy a Hercules Graphics Card Plus and look forward to getting your socks knocked off.

Or you can buy another card and watch while technology leaves you and your socks behind.

To help you make up your mind, we've prepared a little surprise for you on the next page.

Just make sure you're sitting down.

HERCULES
Graphics Card Plus

$299.

Shocked?

We thought you'd be.

Imagine, the new Hercules Graphics Card Plus with the power of RamFont plus everything that made the original Hercules Graphics Card the monochrome standard.

At about half the old price.

Now that's progress.

Call 1-800-532-0600 ext. 204 (in Canada call 1-800-323-0601 ext. 204) for the name of an Authorized Hercules Dealer near you and we'll rush you a free info kit.

Hercules.™
We're strong on graphics.

A Few Words About

VOICE

TECHNOLOGY

Voice-recognition technology helped save Peter Duff's career.

Eighteen years ago, when Duff first watched a boat with his company's name on it sail smoothly over the soft swell of the ocean at Cape Cod, keen competition was the biggest threat the company faced. Since then, Edey & Duff of Buzzards Bay, Massachusetts, has made its mark as an innovative and quality-conscious builder of high-end sailboats.

Recently, a more serious problem threatened Edey & Duff. Duff has suffered from Parkinson's disease since 1969, but he had overcome the physical limitations imposed by the disease to keep the company alive. Then about a year and a half ago, his condition worsened. At least a few times a day he became so debilitated that his voice slurred measurably and his muscles weakened uncontrollably. The simple task of typing a press release on the key-

board of his Compaq computer frequently seemed as gargantuan as crossing the Atlantic in one of his sailboats.

Acting on the recommendation of a friend, Duff bought a Kurzweil KVS voice-recognition system from Kurzweil Applied Intelligence Inc. The KVS, which plugs into the PC, allowed him to trade his computer keyboard for a microphone. Duff inputs copy verbally, and the computer types what it hears onto the screen.

Because the KVS, like all voice recognizers, understands only a limited number of words, even the staff at Kurzweil doubted Duff could use the device efficiently for his application. "I was told very explicitly by the company that the KVS would absolutely not work for word processing because its vocabulary—1,000 words—is not large enough," says Duff. "That's no real problem. In writing advertising copy, I use about the same 500 words 80 percent of the time. And if I'm using a new word, I sim-
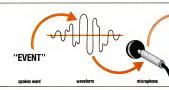
Voice-recognition and speech synthesizer hardware is still in its infancy, but these devices can be immensely useful in many applications for those willing to take the trouble.

Photograph: Craig Cutler

How Voice Recognition Works

The voice-recognition process is practically identical for every unit we tested. The user speaks into the computer through a microphone or telephone. A microprocessor on a plug-in board inside the PC analyzes the word's waveform, changes it from analog to digital codes, and assigns it a digital code. The system compares the code with the vocabulary list you've taught it; when it finds a match, it puts that word on the screen.

"EVENT"

| spoken word | waveform | microphone |

ply spell it into the system." Now Duff spends a productive 4 hours each day at his KVS. He describes it as the device that rejuvenated his spirit and ensured his ability to keep working effectively.

VOICE TECHNOLOGY Peter Duff is one of a small but increasing number of PC users who work with voice technology. This umbrella term includes voice recognition, in which commands and data are spoken into the computer, as in the KVS, and speech synthesizers, in which the computer "recites"—in its own voice—either words that are typed into the machine or preprogrammed scripts.

The sales of voice-technology products as a whole (that is, not only as a peripheral to the PC) reached $20 million in 1985, up from $14 million just 2 years ago. What's more, this year the voice-technology marketplace supported a well-attended 3-day trade show, Speech Tech 86 (presented by Media Dimensions of New York), that highlighted 30 exhibitors and 150 speakers. As attendees moved from booth to booth, one fact became crystal clear: the PC and its compatibles now constitute the dominant hardware in this field. Indeed, many observers feel that the PC is directly responsible for much of the growth in voice technology over the past few years.

"The PC provides the voice-technology industry with something it didn't have for a long time: a standard environment

Interstate Voice Products' VocaLink SRB-LC, the least expensive recognizer.

that makes its products accessible to a much larger market and, in the process, helps bring prices down," says William Creitz, editor of *VoiceNews,* a newsletter that reports on voice technology. "Before the PC appeared on the scene, you typically had big, expensive standalone voice recognizers and speech synthesizers. Now most of the market is tied to the PC plug-in card."

VOICE ON A CARD At the heart of most PC voice-technology products is an expansion board that contains a group of dedicated microprocessors plus an analog-to-digital converter for voice recognition or a digital-to-analog converter for speech synthesis.
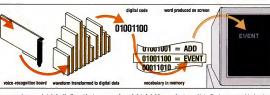
A microphone or a telephone serves as

the input device for a voice recognizer (most products include a microphone). When the spoken word (analog data) enters the voice recognizer, the analog-to-digital converter breaks down its waveform or speech pattern into digital data. The system then attempts to understand the spoken word by matching the resulting digital code with others that have been programmed into it. After it finds a match, the voice recognizer outputs the word or phrase to the PC screen.

Speech synthesis is a far more complicated process. The input device is the keyboard, which sends ordinary ASCII text (digital data) to the synthesizer. This text is first analyzed by a normalizer that expands abbreviations to their full-word form and handles punctuation and other nonalphabetic characters. For instance, the normalizer would translate "Jan. 22nd at 589 Overlook Dr., St. Louis" into "January Twenty-Second at Five Eighty-Nine Overlook Drive, Saint Louis."

The speech synthesizer then looks in its dictionary for each of these words. If they're all there, the digital-to-analog converter transforms the ASCII text into programmed corresponding speech patterns (analog data) that contain information on pronunciation and inflection; the synthesizer then outputs these as spoken words. If an ASCII word is not in the synthesizer's dictionary, it's put through a series of linguistic algorithms that produce phonemes, syllable separa-

digital code   word produced on screen

01001100

01001001 = ADD
01001100 = EVENT
00011010 =

EVENT

voice-recognition board   waveform transformed to digital data   vocabulary in memory

tors, and stress and pitch detail; all provide instructions for coding a word for pronunciation. Then, as before, the coded text is ready for digital-to-analog conversion and output in the computer's voice.

TRAINING YOUR COMPUTER The lion's share of voice products currently available for the PC handle voice recognition. The central software component of these packages is a voice-activated keyboard utility that allows you to train your computer to generate keystrokes from your spoken words.

To start this training session, you first carefully plan a vocabulary of command words (or phrases), with a corresponding instruction for each. For instance, if you're using the voice recognizer as an overlay for DOS, one command could be "Check Disk," and its corresponding instruction, "CHKDSK <Return>." Once you've chosen your vocabulary, you type in the list of words and instructions. Next, by repeating each word a number of times, you train the voice recognizer to understand that the verbal "Check Disk " is equivalent to the ASCII "CHKDSK <Return>." After this session, the computer knows enough to put CHKDSK on the screen and execute the corresponding command each time you speak that phrase into the attached microphone or telephone.

Each training session builds a voice template that depicts the way you pro-

nounce each word. It is helpful to say the word three different ways—one time using normal speech, and the other two using variations on your typical tonal range—so that the template includes a wide range of data about your voice and the different ways you pronounce words.

Teaching voice recognizers is a slow process, and there are limits to how many words they can retain, ranging from a low

The Texas Instruments Speech Library, a full-fledged programming tool.

of 400 to over 1,000 on higher-end products. However, you can have limitless templates, and each can contain the full number of words allowed by the package.

FOUR VOICE RECOGNIZERS The least expensive of the leading voice recognizers is the VocaLink SRB-LC by Inter-

state Voice Products, competitively priced at $395. VocaLink is an easy-to-use voice-activated keyboard utility, and nothing else. Unlike other products, it stores its vocabulary directly on the board in its own 128K of RAM. The board also sports LED status lights and includes its own 16-bit microprocessor.

Menus move you through VocaLink's setup and training processes. Once you've completed the training, you can test the commands in each template for accuracy. (I found VocaLink to be fairly reliable.) However, the menu system is cumbersome: you have to stick to its rigid structure to move from one section of the program to another and do everything from testing how well the voice recognizer understands the tone of your speech to saving the vocabulary.

Unlike more costly voice recognizers, VocaLink is difficult to embed into custom-written programs. But despite its limitations, it is a good, inexpensive introduction to voice recognition, better suited for simple applications like DOS or moving through a spreadsheet than for complicated data input.

Higher-priced voice recognizers offer much more and are less time-consuming to use. This group includes IBM's Voice Communications Option board and *Voice-Activated Keyboard Utility*, Votan's VPC 2000, and the Texas Instruments Speech Library. These fluid, easy-to-navigate systems let users quickly customize any

STATE OF THE

Tech PC Desktop Computers are designed for survival. The XT's leave your desktop looking comfortably empty with their slim non-obtrusive profile; The AT's give you a powerful presence with a clean lined sturdy chassis. Combined with a 14 inch, 800 by 400 line amber monochrome monitor or a 14 inch, 1280 by 800 black and white monochrome monitor you've got State

of the Art staring straight back at you. If 8 MHz 80286 power isn't fast enough for you . . . try the Tech Turbo PC/AT with its 10MHz 80286 and 10 MHz 80287 math co-processor socket. The Tech Turbo PC/AT gives you the strongest, most powerful 80286 performance available from anyone, anywhere . . . available with up to 16 megabytes of memory and hard disks up

VocalLink SRB-LC
Interstate Voice Products
1849 W. Sequoia Ave.
Orange, CA 92668
(714) 937-9010
List Price: $395
Requires: 640K RAM, two disk drives,
DOS 2.0 or later.
In Short: A basic and somewhat limited
voice-activated keyboard utility that generates keystrokes from the spoken word.
CIRCLE 681 ON READER SERVICE CARD

Texas Instruments Speech Library
Texas Instruments
Data Systems Group
P.O. Box 809063
Dallas, TX 78769
(800) 527-3500
List Price: $995
Requires: 192K RAM, two disk drives,
DOS 1.0 or later.
In Short: A full-scale voice-recognition system at a reasonable price. Good documentation makes its programming capabilities easy
to use. However, unreliable performance is a
serious drawback.
CIRCLE 685 ON READER SERVICE CARD

IBM Voice Communications Option
IBM Entry Systems Div.
11400 Burnet Rd.
Austin, TX 78758
(512) 838-8308
List Price: $1,250
Requires: 256K RAM, one disk drive. DOS
2.0 or later.
In Short: An easy-to-install voice-technology board that is required for running the IBM
Voice/Phone Assistant, IBM Voice-Activated
Keyboard Utility, and IBM Augmented
Phone Services, purchased separately (see
next three items).
CIRCLE 687 ON READER SERVICE CARD

IBM Voice/Phone Assistant
List Price: $149
Requires: 275K RAM, two disk drives,
DOS 2.1 or later, IBM Voice Communications
Option.
In Short: A sophisticated background telephone manager and answering machine that
stores incoming messages on a floppy disk
and allows you to change existing messages
locally or from remote locations.
CIRCLE 686 ON READER SERVICE CARD

IBM Voice-Activated Keyboard Utility
List Price: $99
Requires: 448K RAM, one disk drive, DOS
2.1 or later, IBM Voice Communications
Option.
In Short: A disappointing program that allows users to activate keystrokes by voice but
is more cumbersome to train and use than
other voice recognizers.
CIRCLE 685 ON READER SERVICE CARD

IBM Augmented Phone Services
List Price: $149
Requires: 448K RAM, two disk drives, DOS
2.1 or later, IBM Voice Communications
Option.
In Short: A unique, easy-to-use speech synthesizer that enables people with hearing or
speech impairments to communicate over the
telephone.
CIRCLE 685 ON READER SERVICE CARD

VPC 2000
Votan
4487 Technology Dr.
Fremont, CA 94538
(415) 490-7600
List Price: $1,695
Requires: 256K RAM, one disk drive, DOS
2.0 or later.
In Short: An easy-to-use keyboard utility
and expansion board with which you can customize applications to accept voice input.
Has speech-synthesis capabilities.
CIRCLE 683 ON READER SERVICE CARD

Kurzweil KVS
Kurzweil Applied Intelligence Inc.
411 Waverley Oaks Rd.
Waltham, MA 02154
(617) 893-5151
List Price: $6,500
Requires: 256K RAM, one disk drive, DOS
2.0 or later.
In Short: A standalone voice recognizer
with a large vocabulary and some significant
advantages, including excellent user support
and relationships with software vendors.
Drawbacks include a user's manual that is
next to unintelligible and lack of additional
utilities.
CIRCLE 682 ON READER SERVICE CARD

CallText 5000
Speech Plus Inc.
461 N. Bernardo Ave.
Mountain View, CA 94039-7461
(415) 964-7023
List Price: $3,225
Requires: 640K RAM, one disk drive, DOS
2.0 or later.
In Short: A high-powered speech synthesizer, perfect for electronic mail and dispatching
applications. CallText converts typed-in ASCII text to synthetic speech with uncanny accuracy. Not for the technologically faint at
heart, this product requires programming
knowledge.
CIRCLE 684 ON READER SERVICE CARD

home-made and most off-the-shelf programs use voice instead of keyboard input. For that reason, these tend to be the voice recognizers of choice in most specialized factory, technical, and inventory applications.

Setup, training, and use tend to be similar for all of these products. The VPC 2000 has an interesting extra feature that makes it a little more useful than the others: when

you input the instruction that corresponds to your verbal command during a training session, you can also record an instruction that you want the computer to play back each time you issue that verbal command. For instance, if your verbal command is "Check Disk," besides outputting CHK-DSK to the screen, the VPC 2000 can also be programmed to say—in your voice—"I am checking the disk." One application

for this feature would be order entry: the computer could verbally prompt the operator to input certain specific information such as order number, quantity, or price.

THE BARGAIN Texas Instruments Speech Library is, at its $995 price, the bargain among full-scale voice recognizers. It's a well-documented, easy-to-use, full-fledged programming tool that lets

you embed voice-input capability into custom or off-the-shelf programs.

Texas Instruments supplies a microphone that plugs into the back of the expansion board. On a verbal command, the voice-activated keyboard utility directs the computer to type corresponding keystrokes onto the screen. Menus are simple to use and flow well, making it easy and intuitive to get from place to place in the software and to move among applications.

One important caveat: while many users love the TI Speech Library for its price, it has a reputation for being erratic, and my testing confirmed this. For instance, the diagnostic disk provided wouldn't complete the diagnostic: it displayed an error message that was both cryptic and incorrect, telling me that the system wasn't working when it *was* working. During applications, the voice-recognition system seemed to go off at unusual times. Some of these problems appeared to be software related, but others may have had to do with the hardware. In addition, setting DIP switches on the board is a complex process and not well documented.

IBM'S ENTRY IBM's voice-recognition board, the IBM Voice Communications Option, is particularly easy to install because the DIP switches are correctly preset at the factory. A microphone is not included; you can buy your own or use a telephone as your input device.

The separately priced software it runs, called the *IBM Voice-Activated Keyboard Utility*, allows users to activate keystrokes by voice. Unlike most voice recognizers, this program is cumbersome to train and use. It requires a more complex command structure than the other products do: rather than equating a verbal command with a keyboard command in one list, you have to switch back and forth between separate parts of the software and compile two separate lists.

Votan's VPC 2000, an especially easy-to-navigate voice recognizer, lets users quickly customize any home-made and most off-the-shelf programs to use voice instead of keyboard input. The VPC 2000

has two distinguishing characteristics: if programmed to do so, it outputs a verbal message to the user after the user inputs a verbal command; and it allows the user to speak in an almost natural, continuous flow of words, avoiding the stilted speech usually necessary with voice recognizers.

The VPC 2000's hardware includes a

The IBM Voice Communications Option board runs separately priced software.

microphone and speaker that plug into the expansion board. The software includes a programming language that lets you work directly with the special features of the board (most packages use a software interface to shield users from the hardware). This language is an asset for experienced programmers but makes the product significantly less accessible to most users.

All three high-end voice recognizers double as sophisticated telephone managers and answering machines (this enhancement to the IBM Voice Communications Option costs $149; Votan and Texas Instruments offer it as part of their voice-recognition packages). Operating in the background so that they're on call even when you're working on some other application, these devices go well beyond the capabilities of a typical answering machine. Besides delivering a prerecorded message to callers (this is not speech simulation: the message, stored on a floppy or hard disk, is in your own voice) and saving the responses for you to listen to at your convenience, they serve several other useful functions. They keep a running list of the date and time of each incoming call; allow you to

stipulate certain memos for certain callers who can access these messages by typing in a code; store a variety of outgoing messages so that you can instruct the voice-recognition unit to change the selection, even from a remote site; and, on verbal commands, make outgoing phone calls to anybody on your stored directory.

THE KING The Mercedes of the voice-recognition set, at least in terms of price, is the KVS from Kurzweil, the product that Peter Duff uses. Several features set it apart from other voice recognizers: this shoebox-size external peripheral plugs directly into the PC's RS-232 port, costs $6,500, and can handle a vocabulary of up to 1,000 words.

The most obvious advantage to a larger vocabulary, of course, is having more words to work with. But users who don't need all 1,000 words for one application can use the large vocabulary allowance to combine phrases covering a few separate programs into a single KVS dictionary, making it far quicker to move the voice recognizer between different applications programs. Moreover, because of its verbal capacity, often several users can share the KVS, each training it to understand his or her own 300 to 500 words.

Still, despite the KVS's hefty price tag, it is mostly a bare-bones system. It has no telephone manager or programming baubles attached to it, and, except for the increased vocabulary, it doesn't perform markedly more easily or better than the TI, IBM, or Votan products, according to Peter Duff and other users (Kurzweil chose not to supply *PC Magazine* with a product for testing).

Kurzweil tops the other voice-recognition manufacturers in two significant areas. The firm offers excellent support, including a well-manned telephone hotline and on-site installation help from Kurzweil salesmen, as well as, for $500, a day-long training session. In addition, Kurzweil has negotiated partnership with nearly 30 software vendors. These vendors have created vocabularies for their programs, so that users can run KVS with those programs without setting up elaborate verbal command structures. Programs included

in this group are the database managers *Javelin* (Javelin Software) and *Clout* (Microrim); the natural-language filing system *Karl* (Alexander-Robertson Ltd.); the word processor *Mindreader* (Program Resources Inc.); and the circuit-design simulation program *Verilog* (Gateway Design Automation Corp.).

SAY WHAT? Although voice recognizers have come a long way over the past few years, they are still hampered by certain serious performance problems. The most intractable is inaccuracy. Most voice-technology firms claim that their recognition boards can understand their users' commands 95 to 99 percent of the time, but in many environments and situations this statement is more hopeful than true. Different, subtle factors influence how well each product deciphers what it is told.

Some voice recognizers, for instance,

The Kurzweil KVS accepts voice input through a microphone and then analyzes it digitally to produce speech patterns. This screen shows four different ways that the KVS can represent information about one word (from top to bottom) a voice waveform, a voice spectrogram, an energy contour, and spectral cross sections.
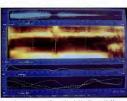
Photo obtained courtesy of Kurzweil Applied Intelligence, Waltham, Massachusetts.

understand the male voice better than the female voice, or vice versa. Similarly, some voice recognizers prefer to listen to a

clear voice and others, surprisingly, are more accurate when the user has a hoarse voice. Background noise also severely af-

VOICES IN THE INDUSTRY

Voice technology, while not exactly taking the corporate world by storm, is making itself felt where keyboards aren't practical and where speech synthesis is a boon.

W hile voice technology is becoming more common on the PC, it's not the commonplace PC applications that drive the phenomenon. Peter Dull's use of the Kurzweil KVS may be compelling and dramatic, but word processing is not a typical use for voice technology, except for users who are physically handicapped. In fact, although many voice-technology firms still claim that soon executives will activate their spreadsheets, database managers, and word processors with spoken commands, most analysts disagree.

"Executives don't want to talk to the computer," says Dan Gooding, director of the Tech-Track Division at the Yankee Group, a Boston-based consulting firm. "A voice-recognition device is no substitute for a good secretary using a word processor."

Voice technology may not succeed in the executive suite, but it is well suited to certain other areas of the corporation. Applications in which entering informa-

tion manually into a computer is difficult or distracting or in which a talking computer can speed the gathering and dissemination of data are prime candidates. For example:

■ The clerk at a refrigerated meat-packing warehouse outside of Chicago wears gloves to keep his hands warm, but when he tries to type information about the arrival and departure of meat into the computer, keyboard errors creep into his work because of the gloves. With a voice recognizer, he dictates shipment data directly into the PC.

■ At an automobile junkyard in Tacoma, Washington, keyboards wore out every few days because employees with greasy hands were fouling them up as they input descriptions of new inventory. Today, a voice recognizer ensures that the keyboards last while the inventory remains under control.

■ Laboratory technicians examining pathology slides through a microscope at a clinic in New York City used to tape-re-

cord the results and then have them transcribed onto the PC, a system that resulted in constant bottlenecks, delays and inaccuracies. Using voice technology, these technicians dictate their analyses directly into the computer.

■ A leading organ transplant coordinating group in Pittsburgh takes calls from organ donors over a computer-answered line. The computer asks a series of questions to determine the exact nature, identity, and condition of the organ being offered, and the potential donors respond by pressing specific buttons on their touch-tone telephones.

■ One of the nation's largest appliance firms, with thousands of salespeople on the road, has set up an elaborate electronic-mail system that relies on speech synthesis. When a salesman calls in for his messages, he types in an access code on the touch-tone phone and the computer "reads" verbatim all the correspondence residing in his cubbyhole of the database.—*Jeffrey Rothfeder*

fects accuracy. Everything from the machine noise in factories to the hum in aircraft cockpits to the constant clacking of printers in offices can distract the voice recognizer and compromise its ability to understand commands.

"To put it simply," says William Creitz of *VoiceNews*, "for the next decade or two recognizers will have difficulty distinguishing between a door slamming and a voice saying 'stop.'"

There is one way to ensure that you get the most out of your voice recognizer and that its accuracy level is at a satisfactory peak: train the device correctly and patiently. Lapses in accuracy are mostly surmountable by correct training, but one currently irreparable constraint is that you can't use continuous speech when talking into a voice recognizer.

Some voice recognizers, notably Votan's VPC 2000, can understand partially continuous speech—perhaps two or three words spoken closely together—but they pay for this feature by being more prone to error. Users, thinking themselves freed from speaking in rigidly stilted prose, begin to lazily slur phrases rather than enunciating them carefully, and the voice recognizer fails to identify their words accurately.

Voice recognizers with larger vocabularies, like the KVS, don't offer even partial continuous speech because it is simply too expensive a research and development effort and would take up too much of the computer's memory to incorporate both functions into one system at one time. Peter Duff describes speaking into the KVS as "akin to reading a list instead of reading a sentence." But, he adds, "you get used to it, and before long it seems a perfectly normal way to input information."

SYNTHETIC SPEECH Voice recognizers are at the leading edge of voice technology, with speech synthesizers trailing measurably. Their manufacturers apparently hope that the success of voice-recognition devices will draw attention to this related market. Because speech synthesis for the PC is still a slow-moving marketplace, it's essentially the province of one firm, Speech Plus Inc. Its product, CallText 5000 (which sells for $3,225), converts

Votan's VPC 2000 can understand partially continuous speech.

Speech Plus' CallText 5000 dominates the speech synthesis market.

typed-in ASCII text to synthetic speech.

When CallText 5000 speaks, it sounds like an earnest Scandinavian who slurs his words during more difficult pronunciations; voice technologists refer to this voice as the Drunken Swede. But delve more deeply into the features of this speech synthesizer, and your disappointment in its voice will dissipate. CallText 5000 enables users to design full-fledged computer-voice output systems that are able, with uncanny accuracy, to "read" text of almost any degree of complexity. Varying inflections, shifting tonal quality, and pitch fluctuations can all be built into the program so that the computer's voice reflects the degree of urgency or softness that you choose. It's perfect for electronic mail or dispatching applications. Be warned, though, that CallText 5000 is not for the technologically faint at heart: it's a complicated utility that requires quite a bit of programming knowledge to use correctly. To preview its features, you can arrange for an interesting demo by calling (415) 969-6257.

Menu-driven software introduces you to the CallText system, then dumps you into a complex programming language. For each new application, you essentially have to create a new program. The documentation that guides you through the process is complicated and dense, and it really is aimed at programmers.

Because of Speech Plus's preeminence in the PC speech-synthesis arena, major firms like Texas Instruments and IBM, which have integrated speech synthesizers into their product lines, have chosen CallText 5000. IBM, for instance, uses CallText as the core of a unique and creative program called *Augmented Phone Services (AUG)*. AUG, which needs the IBM Voice Communications Option board to run, helps people with hearing and speech impairments communicate with people whose hearing is normal by using a touch-tone telephone.

When you make a phone call using AUG, the program dials the number. After the phone is answered, the computer says: "Hello, this is Jane Doe. You and I are talking with the help of an IBM Personal Computer because I have a hearing impairment. To talk to me, you will have to press the buttons on your touch-tone telephone."

■ VOICE TECHNOLOGY

The telephone conversation then consists of messages that you, the hearing-impaired caller, type on your computer keyboard, which *AUG* reads and then speaks, and messages the hearing person sends from his telephone keypad (using the symbol keys to help designate letters), which appear on your computer screen. If only a speech impairment is involved, the person called can speak normally into the phone

■ Voice technology must achieve some lofty goals, such as continuous speech, if it is ever to enter the PC applications mainstream.

while you type your messages on the keyboard, to be spoken by the computer. In addition to this basic calling function, *AUG* can store a series of emergency messages for phoning the police, fire department, and ambulance, and it also can be used as an answering machine.

Voice technology must achieve some lofty goals if it is ever to enter the PC applications mainstream. Among them are continuous speech capability, decreased user involvement in the training process for voice recognizers, improved accuracy rates, a more natural synthetic voice, and larger vocabularies. But it's this challenging agenda that makes the market so enticing to researchers and high technologists. As Larry Hunter, an artificial-intelligence researcher at Yale University, puts it: "The only way that we'll ever achieve our ultimate aim in computing—to develop a machine that is essentially invisible to the user—is by inventing a computer that people can naturally and comfortably talk to and that can talk back in kind. For that reason, voice technology is literally the key to the future of computers."

Jeffrey Rothfeder is a free-lance writer based in New Jersey.

GENERATORS
Give New Life to
COBOL

The business community's investment in COBOL applications was recently estimated at $300 billion. This tremendous commitment to an aging language is propelling software developers to rejuvenate the COBOL-based applications environment. The latest elixirs from the software fountain of youth are COBOL applications generators for the personal computer. Once found exclusively on mainframes, these generators add a friendly, high-level PC interface to COBOL.

A COBOL applications generator translates user specifications into COBOL source code. This code can then be input to a compiler and linker. Typically, the generators prompt you for data and procedures via a set of interactive screens. The resulting applications are not complex, but the source code is a valuable starting place for customized programming and can be created in a fraction of the time that manual coding requires.

These two menu-driven programs that generate high-quality COBOL code from your specifications could help revitalize this aging business language.

THREE CENTRAL FACTORS CO-BOL generators must be evaluated in three areas: how well they integrate and control all aspects of an application, the quality of the resulting programs, and how powerful and ergonomic the generator interface is.

Application control is of paramount concern, especially as the number of files and programs within an application multiply. A generator must keep track of all files, data elements and relationships, screen mappings, and report layouts in order to create correct applications. A good generator will prevent you from inconsistently specifying any of these items and will also point out those inconsistencies

■ You specify your application to *Sourcewriter* through a series of menus that guide you in a top-down fashion through the development process.

and show you how to correct them. For example, the generator should prevent you from creating a program until every file to be referenced by that program is fully defined. Generators usually use data dictionary processing to maintain control of all applications variables. The dictionary should be capable of fully reporting the development status of an application.

Another important aspect of control is the ability to easily extend and modify the original program. Ideally, you specify the modification to the generator, which creates a new version of the program. A good generator will allow you to specify where local code (that is, manually programmed COBOL code, residing in a copy library, that performs tasks beyond the scope of the generator) is to be inserted automatically into the program. Without this ability, a generator's usefulness would diminish after initial program creation because you'd

have to reinsert the local code manually each time the program is re-created.

LOTS OF PERFORM STATEMENTS You can judge the quality of the generated source code in several ways. Well-structured code will display top-down design, with generous use of PERFORM statements. The generator should make generated data items and paragraph labels meaningfully and align and comment code. It should define literals and conditions in the Data Division (where you define all the data you're going to use) and should use tables whenever possible for searching, storing, and retrieving reference information. A generated program should compile cleanly and execute flawlessly.

The types of programs and procedures that an applications generator can create are a good measure of its power. Generators tend to excel in simple record-keeping applications, which involve standard database record maintenance. You can quickly program additions, changes, and deletions of records or data items using generators. Some generators even provide for rudimentary relational processing between two files, and all can create inquiry and report programs. Generators are less skilled at creating detailed edit and calculation code, though ample range checks and date conversions should be available. This limitation means that COBOL programmers won't be made obsolete by generators, though employers should expect greater efficiency from their COBOL warriors armed with generators.

Should data processing managers spend their companies' precious funds on CO-BOL generators? Like all of life's really big decisions, the answer depends on what you want to accomplish. If you are already running a COBOL shop, writing applications on and for PCs, and want more and better code for your money, the answer is an unequivocal yes. If, however, you are writing your applications on the PC for eventual upload and execution on the company mainframe, you should consider instead one of the fine mainframe applications generators.

Micro Focus's *Sourcewriter* and Bytel Corp.'s *COGEN* are two leading CO-

BOL generators (a third, Ken Orr & Associates' *Structure(s)/PC and COBOL Code Generator*, was not available for evaluation). To put each package through its paces, I developed an application that tracks employees and departments and relates one to the other. (This application is similar to the one used to test database management systems for *PC Magazine*'s Project Database II, Volume 5 Number 12. As the generators are essentially database engines, the Project Database application was a good one to build on for this test.)

I evaluated each package's ability to control the development process, generate quality code, and perform in an easy-to-use, intuitive manner. Both generators scored high; the choice between them depends on the features you seek and the skills of the intended user. *Sourcewriter* allows a nonprogrammer to generate applications, whereas *COGEN* is geared to the COBOL programmer. If you desire sophisticated interactive programs with the ability to relate multiple files, *Sourcewriter* is the better choice. You'll prefer *COGEN* if you require highly customized applications or wish to create batch programs.

Sourcewriter

PC COBOL aficionados will not be surprised to learn of Micro Focus's entry into

the generator market. This British firm has consistently led the PC market with integrated software that checks, debugs, and compiles COBOL programs. *Sourcewriter*, a natural extension of Micro Focus's product line, is engineered to the same high level of performance that characterizes the company's other offerings.

Sourcewriter does not try to be a full replacement for COBOL coding. Its purpose is to generate interactively controlled file-maintenance applications that require a modest amount of complexity. You specify your application to *Sourcewriter* through a series of menus that guide you in a top-down fashion through the development process. A data dictionary facility coordinates all aspects of the application.

Before you can generate a program, you must specify the file, screen, and/or report components that the program will reference. The file-definition facility provides a column-oriented screen in which you enter each data item within an indexed-sequential (ISAM) file (a file that can be retrieved sequentially or via an index). This facility provides a good subset of COBOL functionality in that you can specify formats, lengths, occurrences, usage, groupings, and key information.

Certain COBOL capabilities, such as multidimensional arrays, conditional variables, and file organizations other than ISAM, are notably missing from *Sourcewriter*. A nice feature is its ability to associate simple validation rules with the data items you define. You can specify date, range, and (limited) table-lookup validations or the name of a manually coded subroutine. You can also describe a derivation for a data item: the item can be defined as, for instance, the sum of two other items or perhaps as the first five characters of a longer field.

Sourcewriter's most sophisticated feature is its ability to relate files through a File Link facility. Source and target data items can be linked on a one-to-one or one-to-many basis, using one-way or bidirectional links. You can also specify whether target records are mandatory and whether they should be automatically generated as needed. The chief benefit of file linking is that you can create screens that display or update related data from several files at the same time. For the sample application, you

You can customize Sourcewriter applications by choosing file, menu, and procedural attributes from the data dictionary screen. The data dictionary coordinates all aspects of the application.

Sourcewriter's file definition facility accepts a screenful of data item definitions at one time. Although Sourcewriter supplies the column headings, you can use them to produce rather customized applications. In the column labeled FLAGS, you would specify key and link items.

defined the employee's department number as a "link field" to the record key of the associated department file and instructed the application to write a new department record if the department entered on the employee record did not currently exist. Link processing is difficult to write from scratch; *Sourcewriter*'s Link facility saves time and reduces error.

SCREEN PAINTING Programmers with an artistic bent will especially like *Sourcewriter*'s screen-painting facility for defining applications screens and reports. You draw the format of the screen or report by placing fixed and variable fields on the work screen. You can move, copy, and delete lines at will. For screens, you can specify such nifty attributes as color, highlighting, or blinking fields. *Sourcewriter* has field editing for numerics, including zero-suppression and currency. For reports, you can specify headers, footers, detail lines, and total lines.

When you are satisfied with your painted masterpiece, *Sourcewriter* steps you through each variable item, asking you to associate a file data item or derivation rule with the variable. Up to five different files can be specified for the screen. Derived variables will show up in the generated program as Working Storage data items. In my test, the entire process worked well, and the help screens were sufficiently detailed to allow me to keep the manual on the shelf.

Having defined the applications elements to the satisfaction of *Sourcewriter*'s data dictionary, you are now ready to actually create some COBOL code. You can request freestanding programs, or you can choose to divide the application into control and subprograms. In either case, you select the program type (insert, amend, delete, query, general, or report), give the program a name, and in 2 seconds flat you have a COBOL program.

The programs you generate with *Sourcewriter* are designed to be invoked interactively, through a menuing system. The control and error-handling procedures involved with interactive processing add considerable bulk and complexity to the generated programs and occasion the first of my two objections to the package's design: the lack of a batch-program facility.

You are locked into interactive data entry and program execution with *Sourcewriter*. If you could create batch programs that could be run without screens, the savings in program complexity would be enormous.

My other objection is to *Sourcewriter*'s report generation. I'd like to see the package utilize the standard COBOL Report Writer, especially now that Micro Focus's compiler includes this facility.

The actual code generated by *Sourcewriter* is first rate, with good structure, meaningful names, and copious commentary throughout. A seasoned programmer should have no difficulty understanding a generated program upon first encounter, and novices will benefit from the exposure to good technique.

I compiled and tested the sample applications programs on Micro Focus's compiler and was delighted with the perfect results. Of course, the application is rather simple, and a full-blown workout of *Sourcewriter*'s capabilities might reveal a bug or two. But, in general, I found *Sourcewriter* to be a well-integrated, powerful provider of high-quality COBOL code wrapped in an intuitive interface.

COGEN

Bytel helped pioneer the PC COBOL generator market when it introduced *COGEN* in 1983. Unfortunately, time has not been kind to *COGEN*. While the basic function-

FACT FILE

COGEN, Version 6.05
Bytel Corp.
1029 Solano Ave.
Berkeley, CA 94706
(415) 527-1157
List Price: $900
Requires: 128K RAM, two floppy disk drives, a Micro Focus, Microsoft, or Ryan-McFarland COBOL compiler; DOS 2.0 or later.
In Short: A flexible COBOL generator of batch and interactive programs. *COGEN* is not particularly user-friendly, but when mastered it can create highly customized code for complex applications. Not copy protected.

CIRCLE 662 ON READER SERVICE CARD

ality of the package is extensive, using *COGEN* requires a little patience and a lot of reading in the manual. Still, once you become comfortable with it, you'll find *COGEN* can create rather complex programs in a short period of time.

COGEN itself is a COBOL application and runs under the control of a COBOL interpreter or animator. Bytel offers customized versions for Microsoft Corp., Micro Focus, and Ryan-McFarland Corp. compilers. I tested Micro Focus's version.

COGEN is designed for use by a COBOL programmer rather than a general analyst: you specify data and procedural information in COBOL. The advantage of this method is greater control over the program design and access to more COBOL features than you have in a more automatic generator. But you do have to know what you're doing because *COGEN* does not check whether you've entered illegal data names or bad syntax. Very few programmers will generate a perfect application on their first attempt with *COGEN*.

COGEN menus are functionally designed to guide you to a specific component of your application. These components allow you to create files, screens, reports, and batch programs. *COGEN* produces copy elements for each component, which it then integrates into a complete program. You can also include your own manually produced copy element code in the program. Since you are already in your COBOL compiler environment, it is convenient to check and debug your program as soon as it is generated.

You specify data to *COGEN* via its data dictionary facility. You can select sequential, indexed, or relative file organizations. *COGEN* allows you to define just about all the various data attributes available under COBOL, including an edit mask and level number. You can indicate whether a field is a primary or alternate key and whether duplicate keys are allowed. If you specify field validation, *COGEN* will guide you through a dialogue in which you enter the COBOL validation code. Be careful, because *COGEN* neither knows nor cares whether your validation makes sense.

CREATING SCREEN LAYOUTS *COGEN*'s competent screen processor allows you to create customized screen layouts for

your applications. You can invoke the program's template feature to read in a text file containing a screen layout, or you can paint the screen interactively. It's easy to specify the fixed and variable portions of the screen layout since *COGEN* avoids such fancy extra touches as color or blinking fields. You can, however, designate whether the screen is to be erased before display. This feature is important to have if you want your applications to leave valid input on the screen while handling erroneously entered fields.

You associate the variable fields on your painted screen with data items defined in *COGEN*'s data dictionary. *COGEN* informs you when the data item is undefined and assumes it to be a Working Storage field. You can then specify an edit

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■ *COGEN* is designed for use by a COBOL programmer rather than a general analyst: you specify data and procedural information in COBOL.

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pattern, computation and validation code, and an error message for the undefined field. You'll want to create error messages for each input field because the *COGEN* default message ''Invalid Input—Try Again'' is not exactly a wealth of information.

After completing your screen designs, you direct *COGEN* to create the data and procedure copy elements supporting the application's screen dialogues. The generated code will match the unique ACCEPT/DISPLAY syntax particular to the COBOL compiler you are using. I found that this process works well.

GOOD REPORT DEFINITION Report definition is a *COGEN* strong point. You can select up to nine randomly accessed

You must use standard COBOL syntax to describe your data items to COGEN's data dictionary. For instance, PICTURE requires you to enter a valid COBOL PICTURE clause, such as 9(4)v99.

COGEN produces five different types of programs, and its straightforward menus make the process simple. Menu option 6 allows you to ''bind'' copy files—that is, convert copy elements into in-line code.

the Art of Visual COBOL

COBOL programming has just been elevated to an art form thanks to Visual COBOL from mbp. This comprehensive COBOL compiler package gives you mainframe screen management capabilities for your IBM PC. As a result, Visual COBOL turns your color display into a canvas on which you can create professional data entry screens and a very visual user interface.

The heart of Visual COBOL is an interactive mask editor that encourages an artistic approach to screen design. By extending ANSI standards and providing full text editing capabilities, Visual COBOL allows you to create your own masterpiece using a full palette of foreground and background colors. You can easily move, insert, or delete fields; create an unlimited number of windows; even add eye-catching screen animation. In addition, Visual COBOL provides program-controlled video attributes for changing I/O field definitions in real time.

Once you add the final touches to your screen design, the mask editor automatically preserves your work of art in a separate screen library. At the same time, a WORKING-STORAGE definition is created for your mask. It's that simple.

Visual COBOL gives you the screen management capabilities you need. It can make the difference between ordinary software, and software that sells. Just as important, Visual COBOL increases your productivity by saving you valuable time in both the design and coding stages of program development. What's more, screen modifications can be done without recompiling the program, so maintenance is easy.

In addition to providing impressive artistic capabilities, Visual COBOL also gives you high-speed native 8086 machine code, a lightning-quick SORT, extended CHAINing features, a new interactive debugger, execution of DOS commands, multi-keyed ISAM structure, ANSI compatibility, GSA certification, and much more. Versions that support XENIX, UNIX, and both the IBM and Novell networks are also available.

To fully appreciate the screen management capabilities of Visual COBOL, you must see it on your own PC. So for a limited time only, mbp is offering qualified COBOL programmers the opportunity to receive a comprehensive demonstration disk that illustrates the creative potential of this powerful compiler. To find out if you qualify for this offer, simply mail the coupon below or call mbp's toll-free number.

Visual COBOL. $1150.
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art of Visual COBOL.
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(800) 346-4848

Please send me more information on mbp's Visual COBOL compiler.

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Alameda, California 94501

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reference files to augment the data available from the single, sequential master file that drives the report. The report dialogue allows you to move a field from the master file to the key field of a reference file. *COGEN* will subsequently create the code to support this file access.

For each report, you can specify up to nine control breaks, as well as page size and width, report headers and detail lines, and selection criteria. This last feature allows you to bypass those records that fail to meet your selection code, such as employees with incomes over $100,000, for example. Unfortunately, the generated programs do not invoke the standard COBOL Report Writer.

With COGEN, you have the choice of generating batch or conversational programs. This is a particularly useful option because you can avoid much superfluous code by using batch programs whenever possible. Screen manipulation and error-handling logic are costly in terms of potential maintenance and debugging, and so the batch mode is a welcome feature. The batch update feature allows you to select files and records and to specify the MOVE or COMPUTE details of the update. Other notable features of *COGEN* are the program's ability to generate sort and file-initialization programs and to convert copy elements into in-line code.

COGEN performed well on the sample employee application tests. The generated code did contain some minor Data Division bugs, which I easily detected and edited. I was able to associate employee records with department records through a *COGEN* dialogue, though the process was more cumbersome than with *Source-writer*'s Link facility.

My biggest reservation regarding *COGEN* is its somewhat awkward interface. The *COGEN* dialogues are not intuitive, and the package would benefit from the inclusion of help screens and a better manual. Nonetheless, *COGEN* creates well-structured code in far less time than you could ever hope to do it manually, and, if you understand its limitations, it could prove a valuable tool in your company's PC COBOL arsenal. ▱

Eric Bank is an independent consultant based in New York.

THE OPEN ROAD TO INTEGRATED ACCOUNTING

As its name suggests, *Open Systems Accounting Software* (*OSAS*) is an "open system," providing a complete set of source code—and almost *encouraging* adaptation beyond the usual installation procedures. With the release of Version 3.0, the venerable Open Systems hopes to increase its already sizable installed base (its users number in the thousands).

The release of this new version of *OSAS* (not to be confused with *Harmony*, another family of accounting applications from Open Systems), the fourth revision since 1980, includes a Resource Manager, a Report Writer, and 12 accounting modules: Accounts Payable, Accounts Receivable, Fixed Assets, General Ledger, Human Resource Management, Inventory, Job Cost, Payroll, Project Estimating, Purchase Order Processing, Sales Order Processing, and Time Billing. A Materials Management module will soon be available. The modules are well integrated and are consistent in design and approach.

OSAS's well-designed menus promote ease of use and flexibility. You access the accounting functions by selecting one of several options, which are listed in the order in which you are most likely to use them.

Version 3.0's menu options include programs that convert Version 2.0 files to this newer version. These upgraded programs are written in Business BASIC Extended; their source code is included.

We reviewed the multiuser version of

OSAS installed on one of Novell's local area networks. Most modules function smoothly as standalone applications, but Sales Order Processing, Purchase Order Processing, Time Billing, and Project Estimating require other applications modules.

THE RESOURCE MANAGER The Resource Manager, a utility module, handles system housekeeping functions such as establishing the menu system (see Figure 1) and must be installed before you can use any of the other modules. When you choose a menu option, the new menu appears on the right side of the screen and the previous menu on the left. This approach, consistent throughout all the modules, serves as an excellent road map to orient you within the system.

The Resource Manager is used to install the other applications modules—a well-controlled and simple process that ensures that you copy the correct files from the disks provided with each module. Each module requires about 600K bytes of hard disk space for program and table files. Data file size depends, of course, on your business activities.

One of the more important housekeeping functions "sizes" the data files for each of your applications. To size a file, you answer questions about your expected transaction volume, number of customers, number of employees, or other key accounting data. Reviewing file size; an ongoing maintenance task, ensures that your

The latest version of the popular Open Systems Accounting Software *adds new features and modules and retains one of the system's biggest assets: a complete set of its source code available for customization.*

Figure 1: The Resource Manager's main-menu approach is used throughout all the other modules. When you choose a menu option, the new menu appears on the right side of the screen and the previous menu on the left.

system will have sufficient room to create the necessary records. Unfortunately, no system message warns you when you are approaching the file limit, and you obviously cannot continue processing if there is no room available in the data file. You must first remedy the situation by adding the necessary file space.

Another Resource Manager function places designated passwords on any menu option in each module. The system does not require that you use passwords to control access to the menu, but passwords can be useful for establishing proper accounting controls.

A customization feature lets you edit the menu system and add your own programs. You can change the order of any menu, reword the captions, or install a custom menu option. For example, you could add a month-end reporting option that would print all your reports while you performed other duties.

Open Systems allowed us to see its newest version, Resource Manager, Version 3.1 (scheduled for release this year). This revision addresses three main concerns: ease of data entry, error control, and performance in a larger system environment.

When this revised Resource Manager is used with transaction entry screens, pressing the Tab key invokes the windows feature and displays a box with a list of possible values (such as account codes). When you scroll down the list to the correct item and press P to proceed, the value is automatically added to the appropriate field on your screen. Pressing K and any character will start the list with items beginning with that character. For example, if you enter K4 for an account number, the window list will begin with account codes starting with the number 4. Thus, you can can easily customize the window by changing its size and location. More important, you can display other data items in the window to cross-check them against the information you're entering. We expanded the customer ID window for the Enter Invoice screen to show the customer's balance over 120 days and the customer's credit limit. When selecting fields, you have access to and can truncate any field in the key record.

Version 3.1 will reduce file access times when more than one accounting module is installed by creating a separate directory for each module. The current version of the Resource Manager puts all programs in one directory.

GENERAL LEDGER The general ledger is the core of any accounting system, keeping you in touch with the pulse of your business. Attention to detail in planning your chart of accounts structure will make it easier to produce the financial information you need to operate your business. OSAS offers a number of options.

As is typical with general ledger systems, you must first establish three elements: company IDs, charts of accounts, and fiscal periods. You must define each "company" in your organization by creating a single-character company ID. A company can be a division, region, department, or separate business organization. Each company is an entity with its own individual chart of accounts and fiscal periods. If you interface the General Ledger with other OSAS modules, you can define as many as 35 separate companies; if you use the General Ledger as a standalone system, you can have more than twice that number. A chart of accounts can have up to 12 characters in the account number, and you can use 13 accounting periods per year or quarter and access any period at any time for adjustments.

At the Chart of Accounts entry screen, you enter the company ID, account ID, description, account type, current- and prior-year opening balances, and budget information, as well as a "clear-to" account and a "consolidate-to" account. The unique clear-to account feature automates year-end closing procedures; consolidate-to account automates the process of consolidating the ledgers of multiple financial entities.

Although you can define your own unique chart of accounts, OSAS does not go quite far enough in facilitating modern financial reporting. The account number is, in essence, a single element. Many comparable systems subdivide the account code into two or more subelements. For example, one element is typically set aside for department or division. Even though you can structure your chart of accounts to get around this limitation (such as by using 1010.100 for account 1010 in department 100), you'll have to create custom listings to get reports by departments.

You can set up ten groups of recurring entries, each identified with a unique "run" code. The run code allows you to

post the groups as needed throughout the period. Although that is a convenient feature, *OSAS* does not offer standard or reversing journal entries that allow quick transactions.

The General Ledger Journal entry screen is quite simple to use: you enter the company ID, entry date, accounting period, and a source code to indicate the origin of a transaction (for example, M for manual and P for payroll), a description (25 characters), reference (8 characters), and the initial General Ledger account code. The source code can later be used to print selected journal entries and is included automatically in General Ledger entries from other applications modules. Edit controls prevent you from posting to nonexistent accounts.

The program computes the balance as you enter each line of the transaction and prompts you with the necessary debit or credit to balance the entry. On-screen messages will warn you if you attempt to enter an out-of-balance transaction, though a password-override function will let you enter and post entries that are not balanced.

The General Ledger module provides the standard reports and can generate customized reports. In addition to the General Ledger Journal and General Ledger Activity Report, you can generate a list of your recurring entries, your chart of accounts, and a trial balance to review individual account balances.

Designing custom reports will be much easier if you have a well-structured chart of accounts that is designed with both your reporting needs and the capabilities of the system in mind. The system comes with a number of predefined income statement and balance sheet report formats that can be easily copied and then modified.

You create custom reports using two sets of instructions, one for the columns (up to 15 columns on a report) and one for the row formats. This approach lets you define a single report format and use it for different organizations. For example, you might specify columns of data for actual, budget, and variance on an income statement. By designating the company ID when selecting a report, you can use the same print specifications for different companies.

Reports can be printed, displayed on the screen, and sent to an ASCII file or to a *1-2-3* worksheet file. When we installed the Report Writer, we were not able to successfully print to a *1-2-3* file. We were able to use the *1-2-3* and ASCII files to import the data to a *Javelin* model file to produce custom reports quickly, which is a nifty feature.

SALES ORDER PROCESSING Integrating the Sales Order Processing module with the Accounts Receivable, General Ledger, and Inventory modules enables you to display inventory levels and customer credit balances on-line while taking an order. With good judgment, you can avoid unnecessary back orders, delays, or unauthorized extensions of credit. When integrated with the Inventory module, Sales Order Processing helps maintain proper stocking of items and back orders, imposing a greater degree of control over sales and shipments.

To initiate Sales Order Processing, you need to establish two master files: the cus-

tomer file and the ship-to-address file. The customer file includes a customer ID (6 characters), customer name (30 characters), three address fields (25 characters each), phone, salesperson code (3 characters), credit limit, tax code, account type, terms code, finance code, and amount balance fields. The ship-to-address file includes the customer ID, ship-to code (2 digits), customer name, three address fields, and a ship-via field (20 characters). You can store up to 99 different shipping addresses for each customer ID. Using a unique ship-to code for a customer during order entry will automatically fill in the ship-to-address and ship-via fields. Unfortunately, there are no separate ZIP code or city fields, which would allow you to print labels in ZIP code order for discounted mailing rates or targeted marketing.

To enter sales orders, you first enter and approve header information. The software then prompts you for the line item detail of the order, which includes the item number, inventory category code, tax code, general ledger codes (specifying the sales and cost-of-sales general ledger account numbers), quantity ordered, unit of measure, quantity shipped, and price (see Figure 2). For serialized inventory, the system presents a 35-character field in which you enter the unique serial number of the product. This number retrieves the item's cost and price and prevents you from selecting any items that have been committed to another, unposted invoice. After you approve and post the invoice, the items ordered can be removed from inventory. In addition to inventory line items, you can add freight and miscellaneous charges to the order.

The Price Waterhouse Team

G. William Dauphinais is a management consulting services partner in the Sacramento, California, office of Price Waterhouse and has long been a regular writer of and contributor to The Price Waterhouse Report.

Terri C. Connor is a senior consultant in the Chicago office. She specializes in implementing corporate financial reporting systems.

Timothy J. Lee is a management consulting services microcomputer coordinator in the Price Waterhouse national office in New York City.

Figure 2: The Sales Order Processing module's order entry screen shows the detailed information necessary to create orders. The system automatically calculates extended price and tax. For serialized inventory, it prevents you from selecting items committed to another unposted invoice. In addition to inventory line items, you can add freight and miscellaneous charges to an order.

After you enter the order, packing slips can be generated and used by warehouse personnel to fill the order. If warehouse personnel note items actually shipped on the packing slip, the document can be used to verify what goods were actually shipped. This may include the unique serial numbers of goods shipped or notation of items not available in the warehouse (perhaps because of shrinkage or damage) that were thought to be in inventory. This annotated packing slip could be used to revise the invoice and show the change in back-ordered items. Once shipments are verified, you can print invoices. OSAS does not prepare individual bills of lading or packing slips, but you could print a revised packing slip for these purposes.

The Sales Order Processing software is designed to provide useful management information. For example, the open order report allows you to generate reports containing only the information that's important or pertinent (see Figure 3). You can select a unique group of orders by customer ID, warehouse ID, item/job number, or order status and then sort these orders by customer ID, warehouse ID, item/job number, or order status. Such summaries

can help you draw conclusions about efficiency in the stockroom, proper stock levels, and quality of individual items. For instance, you may wish to increase your

■ When integrated with the Inventory module, Sales Order Processing helps maintain proper stocking of items and back orders.

inventory levels or change pricing for certain items that show up continually on back order. If an item is frequently returned, you might consider replacing or discontinuing it.

Proper use of sales order reports helps anticipate inventory trends and requirements. Customer analysis and sales history reports furnish information to determine

your high-profit customers, your best salesperson, or a product's contribution to profit.

We were impressed by this module's focus on management information. At the same time, we were frustrated by the fact that only one receivables general ledger account is used to link Sales Order Processing to the General Ledger. In certain business environments, this limitation could diminish the effectiveness of your receivables reporting.

ACCOUNTS RECEIVABLE The Accounts Receivable module functions well as a standalone application. When integrated with the Inventory module, it updates inventory records as soon as you approve line items on the invoice.

When you install Accounts Receivable, you are given several options for defining discounts, finance charges, taxes, and account coding for sales. You can define nine different discount terms for use in invoicing customers. A finance charge percentage can be established for each company to calculate and assess finance charges on overdue customer balances. Nine sales tax percentage codes can also be predefined. Eighteen pairs of general ledger account number combinations, which can be established to book sales and cost of sales, are specified on each invoice line item to allow for posting of your financial accounts. This approach represented a constraint to one of our clients; we purchased a commercially available modification to extend this limit to 99, enabling our client to record sales and cost-of-sales amounts in specific categories or departments.

You must enter customer and ship-to-address information before processing transactions, just as with the Sales Order Processing module. In addition to the previously mentioned customer data fields, the customer master file contains codes that include one for salesperson, tax rates, payment terms, and finance charges used during transaction entry. As with most comparable accounting systems, you can maintain customer accounts by using either the "balance forward" or "open item" accounting method. If you choose balance forward, you will be applying payments to a single total balance due from a customer, whereas the open-item method

applies payments to specific invoices. Open-item customer balances are updated after posting (usually daily), while balance-forward customer-aging balances are updated after month-end processing.

INVOICE TRANSACTIONS If you install the Sales Order Processing module, the system automatically generates invoices for Accounts Receivable. Three types of invoice transactions are recognized by the system: credit sales, cash sales, and credit memos. Invoice header information calls for the customer ID, salesperson, terms, customer order number and date, ship-to address, shipping number, and shipping date. Using the Invoice Detail screen, you then enter the line items of your order, including a tax code and general ledger account combination code. If the quantity shipped is less than the quantity ordered, the dollar amount of back-ordered items is calculated and displayed. Total sales tax is automatically calculated from the tax code you supplied and is displayed after you enter each line item. You can also enter freight and any miscellaneous charges to the invoice.

The Cash Receipts screen is simple and effective for recording payments received from customers, as well as for recording noncustomer receipts and applying prepayments from customers who have not been billed. After entering the customer ID and the check number, you can apply a payment against a specific invoice or account. If you use the open-item method, the system will display information from the customer's file, allowing you to select the applicable invoice. With balance-forward-type accounts, you can select one of seven aging "periods" to apply the payment. A period can include the oldest balance, the unpaid finance charge, or the current balance.

Sales history is maintained for each customer, including sales, gross profit, and number of invoices for the current period and year-to-date. You can generate customer statements that summarize your customer accounts, and you can add dunning messages, such as "Your account is 30 days past due," to the statement. You can define four such messages based on current and 30-, 60-, and 90-day parameters.

The system has a hold-or-release func-

Figure 3: Using the open-order report screen, also from the Sales Order Processing module, you can sort orders by customer ID, warehouse ID, item/job number, or order status and then generate reports based on the resultant unique group of orders.

tion that allows you to put certain invoices on hold so they won't appear on the customer's statement. No finance charges are assessed against a held invoice, but it will continue to be aged. Credit memos and

> ■ The customer and invoice inquiry functions allow you to quickly assess the status of a customer's account and open invoices.

cash receipts can also be held.

The customer and invoice inquiry functions let you quickly assess the status of a customer's account and open invoices. A word of caution, however: since balance-forward customer files are updated only after month-end maintenance, your aged trial-balance report may not agree with the aged balances in your customer file. This

may pose a problem when you need to make a decision while viewing data on-line during order entry since the aged amounts in the customer master file will reflect only the value from the last time month-end maintenance was run.

In addition to the standard accounts receivable journals and reports, the system provides other useful management information. The cash flow report lists the amount due from customers for any four dates you specify. The sales history report determines your best products, customers, and sales representative. This report can be sorted by customer ID, salesperson, item number, or product category. The customer analysis report gives you sales, gross profit, number of invoices, and other pertinent information for each of your customers—a valuable analytical tool. You can also produce mailing and shipping labels for invoices, statements, announcements, and shipments.

ACCOUNTS PAYABLE With the Accounts Payable module, you can process vendor invoices, prepare debit memos for returned goods, print checks, and employ on-line inquiry into vendor accounts. To install Accounts Payable, you establish a

vendor master file that includes, for each vendor, a unique vendor code (6 characters), name (30 characters), three address fields (25 characters each), one phone number, terms percentage, terms days, amount due, amount prepaid, and purchases history. Additional fields for name of vendor contacts and additional phone numbers would be useful.

Entering vendor invoices is a simple process. You supply the header information, including the vendor code, warehouse ID, invoice number, invoice date, and purchase order number. Since the terms for each vendor are stored in the master file, the system automatically calculates due dates and discount dates.

Once you approve the header information, you enter the invoice detail along with the associated general ledger account distribution. The system will calculate a cash discount and a due date based on the terms specified in the vendor master file. The discount and any prepayment are deducted to arrive at the amount due. For making installment payments to a vendor, the system allows you an "unlimited" number of installments and calculates the corresponding due dates. Once you have entered your purchases, you can print the purchases journal, which provides you with an audit trail of all recorded purchase transactions.

For each payment cycle, you enter a specific date, and all invoices due on or before that date will be selected for payment. This process is disappointing and limiting. Comparable systems offer several options; for example, you can select for payment all invoices eligible for discount, or you can choose all open items either for a vendor or for certain invoices.

You can review and edit the invoice list and make partial payments, hold invoices, or release invoices for payment. After selecting invoices for payment, you can print checks. A predefined check format is available.

The Accounts Payable module offers a variety of reports, including an open-invoice list, check register, vendor analysis, and cash flow report. The vendor analysis report can determine which vendors give you the best discount or suggest that you negotiate discount terms with a frequent vendor. The cash flow report allows you to

project your cash outlays for up to three dates that you supply to the system.

INVENTORY Open Systems' Inventory module can effectively help you manage inventory levels and costs by tracking inventory in separate warehouses, transferring stock from one location to another, and tracking both serialized and nonserialized items in inventory. Each item is assigned an inventory ID (up to 20 characters), a user-defined category, a bin number, a price code, a reorder point, the maximum quantity on hand, up to three vendor codes for vendors that supply the item, and the vendor item number for each

■ Since Open Systems makes the source code available, a network of independent system developers who customize the software has formed.

of those vendors. Three inventory valuation methods are available: FIFO (first in, first out), LIFO (last in, first out), and average cost. When used with other modules, the system maintains the date of last purchase and the date of last sale.

The module is flexible enough to allow you to make gross price changes (by percentages) of all item categories or items within a specific category. This feature is particularly handy when conducting temporary retail sales or markups and markdowns.

Inventory adjustments can be entered to adjust quantity balances after a physical count for obsolescence and shrinkage. The adjustment log has an audit trail to document these changes.

Inventory reports include an inventory status report and a detailed inventory report for each item in stock. The "alert" report points out items that have fallen below the predefined order point to avoid stockouts. The price list and sales analysis re-

port can be used to analyze your pricing structures, and the evaluation report depicts individual year-to-date item sales, costs, and profit margin to help in determining the profitability of your inventory investment.

OTHER MODULES Additional *OSAS* modules include Report Writer, Payroll, Purchase Order Processing, Fixed Assets, Human Resource Management, Job Cost, Time Billing, and Project Estimating.

Report Writer designs custom reports from your accounting data, using up to six different files per report—an impressive capability relative to comparable systems. Payroll is a quite extensive system that provides the necessary interface with Job Cost. Purchase Order Processing tracks orders from purchase to receipt of goods, including returned goods. Fixed Assets can link to the General Ledger to manage your capital investments, and it includes a lease-versus-buy analysis for decision making. Human Resource Management can generate certain reports required by government agencies and track information on employees' salary grades, position codes, and salary histories. It also includes a skills inventory of your employees to help you locate people with the right skills mix.

Job Cost allows you to prepare bids quickly and track the activity of subcontractors, payroll, materials, equipment, and overhead costs for individual jobs. Time Billing is designed to handle the accounting chores for a professional services firm. Invoicing, time and expenses, and work-in-progress reports are some of the features of this module. Project Estimating requires the Time Billing and Accounts Receivable module; it utilizes Time Billing information to provide more-complete project reporting. Materials Management, when released, will interface with the Inventory module, allowing you to schedule and track all components from raw materials through subassemblies to finished goods.

Since Open Systems makes the source code available, a network of independent system developers who customize the software has formed. Some have even created other, complementary modules. Open Systems has recently published a directory with information enabling you to contact

■ THE PRICE WATERHOUSE REPORT

■ An improper entry sequence may drop you out of the program and into BASIC.

these software developers. The company's policy of providing development tools to these independent developers, including standards for the source code, increases the viability of a customized approach.

DOCUMENTATION AND TRAINING
OSAS documentation consists of individual manuals for each application, including the Report Writer and Resource Manager. Although on-line help is not available, the printed documentation is well planned and executed. Each manual offers you lessons with sample data for hands-on experience, installation instructions, and operating instructions. Each contains the available screens and reports and describes the meaning of each system prompt as well as checklists, data entry worksheets (be sure to organize your data before creating master files and system tables), and a section with system messages and suggestions for corrective action. However, you'll need a BASIC language interpreter manual to understand the reasons for BASIC program error statements. Two particularly useful sections include a list of commonly asked questions and answers and a glossary of terms with references to the chapters and sections where each is introduced.

Open Systems conducts installer training, which includes 4 days of intensive classes. User training is also available at $195 per day; all the modules are covered in 3 days.

Open Systems could improve upon its cumbersome method of editing data fields. For instance, it would save keystrokes if you could edit within fields. Instead, before you edit an existing entry, you must type C to completely erase the previous entry before you begin typing. You can type beyond the length of the field on the screen

without receiving an error message. Even more distressing, an improper entry sequence may drop you right out of the program and into the BASIC language command level. Our concern is apparently shared by other OSAS users; we understand that Resource Manager, Version 3.1, will address this problem.

OSAS's strengths lie in the depth of its functionality, the breadth of its family of applications, and—above all—the opportunity it gives you to customize the software if you find this necessary. We would advise against unnecessary modification of the software, but if your business practices are unique, you may find that the customization option makes all the difference. —G. William Dauphinais, Terri C. Connor, and Timothy J. Lee

PUTTING YOUR BUSINESS ON THE MAP

*There's more to business graphics
than pie charts, bar graphs, and reports
decorated with icons. Sometimes,
nothing says it better than a customized map.*

The area with the greatest number of potential buyers. The shortest, least treacherous route. The richest territory. The most favorable climate. The best-situated location. The most-populous sites. Maps can do more than show you how to get somewhere; they can also interpret an area for you. Interpretive or thematic maps, which use data like population, income, and sales statistics to analyze the characteristics of an area, have helped business, government, research, and education succeed since Babylonian times, when people first used maps to record land ownership and assess taxes.

You probably used your first interpretive maps in grade school, when you glued a cotton ball to Alabama, a piece of coal to West Virginia, and some cereal to Iowa or colored the most-populous countries of the world red and the least-populous yellow. The interpretive map is an essential business, government, research, and education tool, both for analyzing information geo-

graphically and for presenting it in a way that people can readily grasp. Some typical uses of interpretive maps are to analyze trade areas, identify sites for locations, target marketing areas, design sales territories, monitor sales performance, allot advertising expenditures, plan communities, and analyze traffic patterns. Maps can enliven business presentations and communicate complex information faster and with more impact than any other graphic tool.

NEW SOLUTION Until recently, businesses and other groups that needed to present analytical or descriptive data with a geographic relationship had four choices: use charts and tables created with a spreadsheet or database program, sacrificing the advantages of colorful, easily understood maps; employ a graphic artist to depict data generated with a spreadsheet, database, or outside data supplier, adding time and expense to the process; use an expensive mainframe or minicomputer system involving special programming and often slow turnaround time; or hire a mapping service bureau, also entailing high cost and time, in addition to depriving the group of the chance to modify the maps as they're created. PC graphics programs gave them another option: analyze data with a spreadsheet or database and outline a map with a graphics package, adding labels and symbols to convey information about the areas mapped (see sidebar "Mapmaking with Graphics Packages" at right). But with the advent of dedicated mapping software for the PC—a new niche of business-presentation graphics that in some cases also offers data analysis and editing capabilities—business, government, research, and education groups can now quickly and easily create and present vibrant, full-color, persuasive maps that show pertinent demographic and other statistical information.

The applications of PC mapping programs are numerous and varied. Insurance companies use them to decide where agents are most needed across the country. Banks use them to choose the best locations for automated teller machines. Advertising agencies use them as part of almost every activity they're involved in, including depicting television and radio advertising regions like areas of dominant interest (ADIs) or designated market areas

MAPMAKING WITH GRAPHICS PACKAGES
In addition to charts, graphs, diagrams, and flowcharts, these four graphics packages also create maps.

You may already have a program in-house that will create maps for your business presentations. The following four highly rated graphics packages include outline maps along with their other shapes. They won't put interpretive data on the map as the standalone mapping programs do so effectively, but you can add symbols and labels to describe your information. If all you need are some basic, good-looking maps for business presentations, marking sales and service territories or the locations of plants or branches, for example, these programs can handle the job as well as your other graphics needs—charts, graphs, diagrams, forms, flowcharts, logos, and so forth.

Diagraph from Computer Support Corp. of Carrollton, Texas, is a fast, polished, easy-to-learn graphics package (reviewed in "Diagraph Sets the Pace for 'Business Quality' Graphics," *PC Magazine*, Volume 5 Number 6). This popular program has a U.S. maps library that includes low-, medium-, and high-resolution maps of the 50 states. *Diagraph* allows you to combine states into sales regions and territories and to add labels and legends using high-resolution, solid-filled typefaces. You can place symbols from an extensive symbol library anywhere on the screen and then move, stretch, compress, rotate, flip, and mirror them. Many other features enable you to change and enhance your maps. Then you can display, print, and plot them in full color or by shading states and regions using any of the 54 available shading patterns. *Diagraph*, which retails for $395, comes with over 2,200 symbols and 13 typefaces, and you can order optional symbols, typefaces, company logos, and custom libraries. It supports a wide range of printers, Hewlett-Packard plotters, and 35mm range recorders.

Freelance, recently acquired by Lotus Development Corp. from Graphic Communications of Waltham, Massachusetts, and a 1986 winner of a *PC Magazine* Award for Technical Excellence, includes maps of the 50 U.S. states along with its more than 150 symbols. The package offers a wide range of graphics features that let you create impressive presentations. *Freelance*'s ease of use and its ability to import ASCII text and *1-2-3* .PIC files for charting are its main selling points. It comes with mouse and digitizing tablet support, all for $395.

VCN ExecuVision from Visual Communications Network of Cambridge, Massachusetts, also creates maps and also sells for $395. Our reviewer called it the "Cadillac of presentation graphics" (see "Business Graphics: Giving Power to Presentations" *PC Magazine*, Volume 4 Number 12). With *ExecuVision*'s International Atlas library (1 of 19 graphics libraries offered by VCN at $90 each, with discounts for multiple purchases), you can create a sales-by-state presentation. The program enables you to color particular states and print text within them. You can also highlight towns or districts within a state. You can enter your data from scratch or, if you buy the $75 *EV Capture* module, capture a screen while running another applications program.

A new package from the same company, *VCN Concorde* (suggested retail price, $695, including complete image database; $350, with trade-in of *VCN ExecuVision* manual) offers fully integrated capabilities in both medium and high resolution for business graphics, high-quality text, free-hand screen painting, animation, and self-running presentations. It plots tailored graphs directly using data from *1-2-3*, *Symphony*,

Diagraph,
Release 3.3.1
Computer Support Corp.
2215 Midway Rd.
Carrollton, TX 75006
(214) 661-8960
List Price: $395; *U.S. Maps*, $99

Requires: 384K RAM, IBM Color/Graphics Adapter, IBM Enhanced Graphics Adapter, Tecmar Graphics Master, Hercules Graphics Card, or the HP Multimode graphics board, 8087 math coprocessor chip recommended for increased speed and performance, DOS 2.0 or later. Supports a wide range of printers and plotters.

In Short: An interactive business graphics package that enables even novice users to quickly create a wide variety of professional-looking presentation aids, organizational charts, forms, flowcharts, diagrams, signs, and word charts; *U.S. Maps* library includes maps of all 50 states that you can combine, color, shade, and label. Copy protected.

CIRCLE 820 ON READER SERVICE CARD

Freelance
Lotus Development Corp.
200 Fifth Ave.
Waltham, MA 02254
(617) 890-8778
List Price: $395 (*Graphwriter*, $395; extended version with additional chart types, $595)

Requires: 256K RAM, two disk drives, DOS 2.0 or later. Supports IBM Enhanced Graphics Adapter and standard IBM and Hercules cards, Microsoft and Mouse Systems mice, and high-quality printers and plotters.

In Short: A powerful package that generates sophisticated business presentations and enhances existing *1-2-3* graphs; comes with a library of over 200 common images, including the map of the United States and maps of each state. Not copy protected.

CIRCLE 826 ON READER SERVICE CARD

VCN ExecuVision
Visual Communications Network Inc.
238 Main St.
Cambridge, MA 02142
(617) 497-4000
List Price: $395; libraries, $90 each.

Requires: 356K main resolution, two disk drives, monitor with color graphics adapter, DOS 2.0 or later. Supports mice, digitizers, tablets, and many standard printers and plotters.

In Short: A highly rated business graphics software program that lets you combine multiple text fonts, business data, charts, graphics, and pictures for presentations; you can choose prerendered images from additional-cost libraries or create original images. Copy protected.

CIRCLE 827 ON READER SERVICE CARD

VCN Concorde
Visual Communications Network Inc.
238 Main St.
Cambridge, MA 02142
(617) 497-4000
List Price: $695, including complete image database; $350 with trade-in of *VCN ExecuVision* manual.

Requires: 348K RAM in main resolution, 640K in high resolution, two disk drives, CGA- and EGA-compatible graphics board, DOS 2.0 or later. Supports mice, digitizers, and tablets and many standard printers and plotters.

In Short: An impressive state-of-the-art integrated package that produces business graphics, high-quality text, free-hand screen painting, animation, and self-running presentation; comes complete with a database of over 2,000 professionally drawn icons, symbols, and images, including maps. Copy protected.

CIRCLE 828 ON READER SERVICE CARD

Multiplan, and DIF-format spreadsheets. All text is proportionally spaced with 15 high-resolution and 15 medium-resolution fonts available, each of which you can scale, tilt, shadow, color, or underline. You also get a full graphics capability with multiple-level zoom, choice of 64 colors, unlimited patterns, and complete scaling. Mouse support is included. The animation function allows for the dynamic illustration of any concept, and you can create your own animations or use the animation library that's included.

—*Carol Olsen Day*

(DMAs), designing direct-mail campaigns, and helping to plan new products for certain consumer groups. Retailers use map programs to determine franchise locations and shipping routes. Manufacturers are analyzing market share and examining distribution channels with PC-based map programs. City planners use them to assess future water consumption in communities and plan transportation and school systems. Political groups analyze voting patterns and party affiliation with map programs. Research groups are using the programs to analyze outbreaks of disease and to study environmental changes. Schools and universities are using them to train students in geography, engineering, sociology, architecture, city planning, and so forth. Nearly every business, government, research, and education group that uses PCs can now take advantage of mapping software to convert dull, complex data into attractive, communicative maps.

WHAT YOU'LL NEED To use most PC mapping programs, you'll need a PC with a display monitor and a graphics card (color capabilities are strongly recommended, and a hard disk will, of course, make things easier), a pen plotter (sometimes a dot matrix printer will suffice), and both boundary files and data files.

Boundary files are what the programs use to draw geographical features like country, state, and county outlines, city limits, ZIP code areas, and so forth. The boundaries of these features are stored in the file as a series of *x, y* coordinates or latitude and longitude points. The software draws the map boundaries by connecting the points to make polygons that represent geographical areas. Some boundary files usually come with the software, but to create custom areas, you'll need to alter the packaged files by combining areas or zooming or exploding (see the glossary of terms that accompanies this article), purchase additional files from the vendor, or input the coordinates yourself (a possibility with three of the programs reviewed here—surprisingly, the two most basic programs and the most complex one) by digitizing the areas by hand or with the aid of a digitizing tablet, mouse, or light pen (not supported by all programs).

Data files contain statistical data with a

geographic component: the number of residents per square mile, the average income per household, the number of widgets sold, the number of residents over age 50, and so on. You can purchase data files from the software vendor, export them from a popular database or spreadsheet program when using four of the five programs reviewed here, or, with two of the programs, input the data by hand, creating your own files. The programs show the data by color shading the areas, using dots to represent units of data, or assigning a pattern of characters or hatches to the areas and by showing a legend that gives the ranges of the data variables displayed. Since most businesses are more likely to have the data they need on hand than they are to have the boundary information, many find it convenient to buy boundary files and create their own data files.

WHAT TO LOOK FOR PC mapping software runs the spectrum, from inexpensive programs that have low memory requirements, can use your printer to draw maps, and require you to enter your own coordinates for boundary files to those that cost more, require more memory and equipment, and offer sophisticated data-analysis and display features. Features to look for include flexibility in manipulating data and data ranges; the ability to add features like store locations and highways to a map, to label points of interest, to zoom in and focus on a small area, and to add text to a map. More-advanced programs will easily import data from a spreadsheet or database, print out tabular reports of your data, offer a range of colors and patterns, let you combine areas, store your maps for easy display in a presentation, and support a device like the Polaroid Palette, which can make slides from your screen images.

Another important consideration is the availability of data and boundary files that fit your needs. When evaluating the cost of a program, you'll want to consider the cost of additional files. ZIP code files from one vendor, for example, can range from $195 for a particular state to $5,000 for the entire United States. You'll also want to analyze your needs in terms of staff available to do the mapping, what data you already have on hand, and whether your needs are mainly for sales presentations every 3 months or

for data analysis and presentation on a more frequent schedule.

The following five programs range from the no-frills, do-it-yourself type—*MAPIT* and *Polymaps*—to the more expensive, everything-automated type—*Map-Master*, *Rundmap*, and *Atlas AMP*.

> ■ When evaluating the cost of a program, you'll want to consider the cost of additional files.

MAPIT

Raymond J. Kalush of Questionnaire Service Co. in East Lansing, Michigan, created *MAPIT* about 2 years ago to fill the needs of low-budget institutions and small companies. His inspiration for the program came when he was working at a health-maintenance organization that wanted to map subscribers by ZIP code and could find no suitable package for the PC. Kalush went to work, taking many of his ideas for *MAPIT* from Harvard's *SYMAP* and the Laboratory for Computer Graphics' *CALFORM*, both mainframe packages. The result was *MAPIT*.

Kalush has done a fine job of creating a no-frills mapping program for use by not-for-profit groups, local government agencies, schools, and laboratories for both analyzing and presenting geographic and statistical data, and perhaps even for business for analyzing data on hand, but *MAPIT*'s output cannot compare to the slick graphics the more-expensive programs can produce. Its output would look fine in a proposal from a not-for-profit organization but not very competitive in a presentation from a Fortune 500 firm. Nor will maps you create with *MAPIT* look comparable on your monitor's display screen with those of some of the other programs.

The standard medium for *MAPIT* maps is the printer. The program is designed to print a map on one page. Even though you won't be able to see the entire map you plot on one screen, a few screens will unveil it

(reconfiguring using MCONFIG will let you see the map on one screen, but that will give you less resolution on the printed map; a medium-resolution one-screen display of the map is under development for future release). You don't need expensive equipment like a plotter to use *MAPIT*—your printer will do the job—but you'll have to rely on hard copy to see the finished product. Kalush has enhanced the newest version of the program, however, to support the Hewlett-Packard 7400 series of plotters and compatibles, and plotter output is very presentable.

MAPIT can create four types of maps: outline, conformant, interpolative, and trend surface. An outline map is what it sounds like—simply the outline of the area or areas you're mapping (all the programs reviewed here can give you outline maps, as can the graphics package mentioned in the sidebar "Mapmaking with Graphics Packages"). A conformant map, also called interpretive by some of the other programs reviewed here, displays different regions with different symbols. This type of map is the one that most mapping programs are designed to create, to represent various demographic and statistical information; one difference is that *MAPIT* represents the data with keyboard symbols like periods, asterisks, and dollar signs, whereas the more-expensive programs use colored hatching and other patterns.

TREND SURFACE MAPS *MAPIT* also creates interpolative and trend surface maps, which use a scale system to represent all the positions on the map. In an interpolative map, the symbols do not change abruptly at the borders of the areas within the map; rather they are smoothed out across the borders according to the given scale. A trend surface map looks similar to the interpolative map, but the changes in detail are much smoother because a mathematical equation in addition to the scale determines the patterns. A trend surface map is often characterized by a smooth shading that starts deeper at one point and fans out, progressively lighter, in a geometric shape like a parabola, for example.

MAPIT comes with files and coordinates that enable you to map Africa, Asia, Australia, Canada, Europe, South America, the United States, and the various

You won't need a color/graphics card or color monitor to use MAPIT, but you can plot maps in color if you like. You can also specify the size of your maps and produce a map with a wide-carriage printer or plotter, as long as you don't exceed 250 lines across. The principal medium for MAPIT is the printer; note the symbols that create the patterns for each range: the x, the plus sign, the greater than sign, the colon, and the period. Full state names rather than just two-letter abbreviations can be added, but notice that Alaska and Hawaii are missing and that the areas of the country are contiguous, not "exploded." To explode areas with MAPIT, you'd have to create different polygons to include the geographical divisions you want to separate—the East, South, Midwest, and West, for example.

countries and states within them. An appendix supplies the ASCII decimal/character equivalents you'll need if you want to change the default characters MAPIT uses as symbols.

MAPIT is a no-frills program: no fancy menus direct you, but you do go a help summary, as well as prompting at each command level. The program includes no tutorials per se, but you don't really need one—the examples in the well-written user manual are very clear and easy to follow. Installing the program is a cinch. Creating map outlines by using the files included with the program is also easy.

To create a map with MAPIT, you need to use commands, filenames, area names, and numbers, with which you "program" a map. For example, get.europe.map./france.x would give you the map of France from the file that contains the coordinates for Europe, which MAPIT supplies. Here we're using the Get command, which retrieves data and outlines from a file; the filename europe.map, and the area name france. Additional commands would determine the type of map, the data to be shown, the label, and whether to show the map on the screen or to print it. To add data to this map, you'd use the Data command and your data (for example, population or gross national product, which you must input yourself since MAPIT supplies no data files. The other programs reviewed here can import data from programs like 1-2-3, Symphony, or dBASE; with MAPIT, since you input all the data—whether statistical or boundary-related—you'd have to do the importing by hand, typing it in or taking it from a file created with your editor.

While this system is not as slick as those of the more expensive programs, the fact is you'll probably have to enter or import your own data no matter which program you use, unless you pay for additional files. And MAPIT's system gives you control over your input; you can decide to spell out state or country names, for example, whereas in the prepackaged boundary files for the other programs, you'd get automat-

ic labeling that would be a two-letter code. You can incorporate whatever cities or geographic features you need to show. You can also add vertical and diagonal labels—a nice touch—and choose the scale and the symbols to emphasize the point you're trying to make with your data. Plus, you can choose the dimensions of your maps.

Another way to input with MAPIT is to use a command file—the preferred way to show most maps. You would use an editor to type the commands into a file and then ask MAPIT to read that file and act on the commands in it. That way, when you've gone to all the effort of creating a map, you can easily access it on file for editing or reprinting.

A TRICKY BUSINESS Creating maps of your own is tricky, though. If you need to map an area for which MAPIT does not have a built-in file or does not list the coordinates (this will almost always be the case unless your needs are very simple and you're concerned with only the continents and the countries they include and not cities, sales territories, ZIP code areas, and so forth), you'll have to do what the clearly written and easy-to-follow—but again no-frills—MAPIT manual calls "a fair

amount of work." *MAPIT* sells a database of outlines of all the counties in the United States, except for those in Alaska and Hawaii, for $95. But if you want to map another area with *MAPIT*, you must input pairs of numbers (the *x* and the *y* coordinates) that correspond to each point on the outline of your region, or, in other words, digitize the area.

You can digitize by hand or with a digitizer. But no matter how you do it, entering all the coordinates for your custom area (unless it's a simple polygon with only a few points) involves a lot of time and effort. Since *MAPIT* doesn't have an editor, you'll have to use your own (actually a bonus since you wouldn't want to learn another one anyway) to enter the data into your system. If you generally need to map only a few areas, adding different data to a few maps, you can save the mapped area in a file to use again and again.

MAPIT's low price, clear manual, and its adaptability for use with only 128K bytes of RAM, one disk drive, and a printer make it attractive for use in the classroom, by community agencies, and by local political or civic groups. And if you're interested in interpolative and trend surface maps and don't mind inputting a lot of coordinates, you'll want to take a look at *MAPIT*. But business users with budgets that can accommodate higher outlays will undoubtedly want the cozy interface, sophisticated features, and slick output of some of the newer entries in the market.

Polymaps

Another inexpensive software program that can use your printer to produce interpretive maps has been available for more than a year and a half in its PC version and for more than 4 years in its Apple version: *Polymaps*, from Community Research & Information Systems. With its roots in the mainframe system called DIDS (Domestic Information Display System), which is based in Washington, D.C., and runs on a VAX 11-1780 with about 1,000 different databases, *Polymaps* was created by Thomas Curtin for groups that need maps lacking standard geography and that can't afford an expensive program with the added expense of customized files.

You can also use *Polymaps* to produce bar, line, and pie charts, using the same

> ■ The printed maps *Polymaps* creates look somewhat slicker than those of *MAPIT*, and you can also produce very presentable plotted maps.

data you use for mapping. The printed maps *Polymaps* creates look somewhat slicker than those of *MAPIT*, and you can also produce very presentable plotted maps.

Polymaps, which comes with a system disk, sample data disks, and an installation disk, runs as a sequence of menus from which you select an option like Polygon Create/Edit by pressing a function key or as a set of freestanding programs you can execute from the system disk without going through the menus. Installing *Polymaps* is easy; you simply follow the screen prompts, responding appropriately to questions about your hardware setup. The main menu appears automatically after you use the AUTOEXEC command on the installation disk.

WALK-THROUGHS The program's draft-quality, amateurish manual needs improvement; *Polymaps*'s vendor should take a look at *MAPIT*'s documentation for a model of how to organize and present information clearly on a low budget. "Structured walk-throughs" take the place of a tutorial or a step-by-step guide. When searching for guidance on a particular topic, you must rely on the table of contents because the manual lacks both an alphabetical reference section and an index.

To use *Polymaps*, you must create databases of your customized mapping information, including statistical and boundary data. The program comes with a database of the boundaries of the U.S. states, as well as some sample statistical data. You can also load external data files from programs like *Symphony*. Since

PERCENT SALES GROWTH BY POLYMAPS

CALL 716-736-4100 FOR INFORMATION —Sample #1

■	1
	17
	17
	33
	50

You can generate Polymaps maps with a dot matrix printer, but here's what output from a plotter looks like, with the three colors indicating the three ranges, which appear labeled with numbers only in the upper-right-hand corner. The areas of the country are "exploded," separated into four geographical divisions. State abbreviations have been added automatically, and a comment about the gains in Florida is used to add information.

Community Research & Information offers a free user-donated library, you may find that you can map many other areas without much effort on your part, too. But as with *MAPIT*, you'll have to enter the coordinates of your own customized areas, unless you ask the company to customize special files for you at an additional cost. The "geo definition" process, or defining the areas you want to map, involves three steps: identifying how many geographic units you want to define (for example, six sales areas, 14 neighborhoods, 52 ZIP code areas, or 110 census tracts), determining a coordinate system for your digitizing process (reducing a map to a list of numbered *x* and *y* coordinates that represent its outline), and actually digitizing the map. As the manual notes, when dealing with a large map, you may need to spend 8 to 16 hours to complete the geodefinition stage. Many of *Polymaps*'s sales are to universities, where teachers want the students to learn how to create maps this way; businesses may find it takes too much time and effort unless someone on their staff already has learned the skill.

MAKING POLYGONS To create a map, you first choose Polygon Edit/Create. The system prompts you to make sure that you have a formatted disk for a new data file in your disk drive and that you have the *x* and *y* coordinates for your polygons ready. When you give the go-ahead, *Polymaps* shows you the command menu for Polygon Edit/Create, from which you select the appropriate mnemonic single-letter command. If you're creating a new map, here's when you'll enter the values of the *x* and *y* coordinates for each polygon and choose whether you want to view the polygons normally or zoomed. When you print or plot the map, you can see how it looks and compare it with the actual area you're mapping. If adjustments are needed to make it appear more detailed and thus more realistic, you can adjust your coordinates, most likely adding more levels of definition. When you're satisfied with your polygons, you can save them for future use and, more importantly, add statistical data that will make them interpretive maps rather than simply outline or spatial maps. You can also zoom and explode with *Polymaps*.

To add data for mapping and creating chart and tabular output, you select Data Entry/Data Management. You can enter the data by inputting it through the keyboard, computing it from existing data, loading it from external sequential files, or, of course, editing and deleting it once it has been loaded into the *Polymaps* database. None of these tasks are really difficult, but the manual is sometimes so vague at telling you how to proceed at each step that you start to wonder whether you should instead hire someone to analyze your data geographically and then enlist an artist to draw the maps.

If you can find someone who's experienced with the program to lead you through building interpretive maps (maybe you could even get someone to do the dirty work for you—compiling all the coordinates needed to turn rough polygons into a realistic map), you may eventually find *Polymaps* to be a valuable business graphics tool. The output looks good. You can use it to create pie, bar, polybar, line, and scatter charts, as well as to interpret your data geographically, and the price is right. But factor the time and effort you'll spend against the price—you may decide you can afford one of the slicker, more-expensive packages on the market. With a better

manual (which Curtin says is coming soon) and a few improvements, though, *Polymaps* could contend with some of the higher-priced packages.

Map-Master

A new entry into the PC mapping software market, *Map-Master* is a sophisticated, elegant addition to Decision Resources' series of graphics programs that create customized charts, signs, diagrams, and now maps. *Map-Master* comes with more data than most mapping programs, at no extra cost—information to map the United States by state, including 1985 population, retail sales, age, and income statistics. Also included in the package, to whet your appetite for the many additional files that are available, are files to map Louisiana by county and Manhattan by ZIP code according to various population, age, and income statistics. But to create maps of your own customized areas, not included in the boundary files that come with the program, you'll need to purchase additional files from Decision Resources.

The *Map-Master* package includes four program disks and a boundaries and statistics samples disk. The copy-protection scheme includes a hard disk install and uninstall option. Using a hard disk with the program increases mapping speed, but you

TURNER–STEVENS, INC.
FIRST QUARTER SALES BY STATE

NORTH-CENTRAL
$12.6 MILLION

NORTHEAST
$34 MILLION

WEST
$23 MILLION

SOUTH-CENTRAL
$17.6 MILLION

SOUTHEAST
$14.7 MILLION

Millions of Dollars

▲ REGIONAL OFFICES

☐ LESS THAN 2
☐ 2 TO 4
☐ MORE THAN 4

Map-Master's plotted map showing sales by a particular company for the United States has three ranges with a legend, range title underlined, and caret symbol to indicate regional offices. The regions are exploded and labeled as well. Note the two-line title and the different axis type. *Map-Master can also use different typefaces and add icons as well as use italics. No state names are given here, but the program will add the two-letter abbreviations if you wish.*

can also run *Map-Master* on floppy disk drives; in that case, the program prompts you to insert the necessary disks in the correct drives as you select a new operation.

Map-Master, which is menu-driven, is easy to use and reassuring. The program automatically stores each component as you create or edit a map. Prompt lines at the bottom of each screen tell you at a glance how to make an entry or a menu selection.

Even if you've never used a PC program before, you'll find *Map-Master's* well-designed, step-by-step manual easy to follow. It starts with the basics, telling you how to create subdirectories when you install the program on a hard disk and even discussing what you need to know about using the IBM keyboard and how to deal with floppy disks. Plus, the glossary explains important technical terms—from *alphanumeric* to *zoom*.

The manual also clearly describes the parts of a map and different types of maps. *Map-Master* maps can have one or two levels of geographic boundaries defining regions. The United States by state, for ex-

ample, is a one-level map; the United States by county is a two-level map, with the first level being the state boundaries and the second level the county boundaries.

Installing *Map-Master* is straightforward and easy. After installing the program, you're greeted by *Map-Master's* main menu. It and subsequent menus tell you how to create a new map; edit a map and its data, title, or legend; plot a map on screen, printer, plotter, or film recorder or change the plotting options; retrieve or delete stored maps for editing or plotting or erase them if no longer needed; use *Map-Master's* DataGrabber to bring data into a map from a spreadsheet or database file; print a list of the data values stored with each region in a map; and reconfigure hardware, initialize a map storage disk, copy a map, or install or uninstall boundaries and statistics files on a hard disk.

5-MINUTE TUTORIAL Creating a map with *Map-Master* is simple and quick. *Map-Master* includes a 5-minute lesson that illustrates each of the steps and gives

you a feel for how to create and plot maps. Then you're on your own: the reference section of the manual, arranged with topics in alphabetical order, gives you all the help you need.

To enter data, you retrieve a copy of a map you've created and, with the main menu displayed, select Edit Map. You'll then be shown the Editor menu, from which you choose Data. To select a set of variables from one of *Map-Master's* libraries, for example, you choose Select/Load Variable Set from the Data menu. *Map-Master* then displays the screen that lists the variables stored with the map and their sources. You indicate the variables, such as population, you want mapped and then calculate variables at this point by dividing one by another; for example, to select per capita income, you'd divide income by population. You can also enter variables manually at this point.

Say you want to show the location of a corporate headquarters and regional sales offices. First you would retrieve a stored map or create a map and then edit it by choosing the Edit menu from the main menu; Map Layout, Labels, and Symbols from the Editor menu; and Map Labels and Symbols from the Map menu. When the Labels and Symbols screen is displayed, you'd use the cursor movement keys to position the cursor where you want to add labels, symbols, or lines and follow the on-screen directions. You can mark the locations of the headquarters and the offices with symbols from the *Map-Master's* Basic Symbol Set, which includes nine commonly used symbols (*x*; open circle, square, and triangle; plus sign; closed circle, square, and triangle; and line). You can also use the additional 94 symbols and icons in the Symbol Font (including, for example, car, plane, stop sign, phone, boat, money, sun, arrows, math symbols, and so on). Then you can add labels and draw lines to the locations. You can also specify up to 16 different sizes for symbols and text; choose italic or roman; center, left justify or right justify, underline, and print or plot them in any one of eight colors. The various graphics presentation options are what make *Map-Master* shine.

Map-Master is flexible, too. It lets you set the number of ranges you want shown in a map and the lower and the upper limit

ZEROING IN:
IMPRESSIVE POSSIBILITIES

FIRST QUARTER REVENUE TOTALS FOR INTERNATIONAL OFFICES

South America - $75MM Asia - $100MM
North America - $350MM Europe - $300MM
United Kingdom - $60MM Australia - $50MM

TRADE AREA ANALYSIS

Penetration: Number of Customers/number of Households) by ZIP Code

The Delaware River is a barrier for customer access to the Philadelphia store.

TEXAS MARKET SHARE
AMERICAN BUSINESS SYSTEMS

DALLAS - 36%
EL PASO - 33%

LESS THAN 20%
20% TO 30%
MORE THAN 30%

SAN ANTONIO - 34% HOUSTON - 41%

Illinois Prospective Facility Sites
Fiscal Year 1987

Manufacturing Plants
Chicago
Moline
Bloomington

Chemical Plants
Peoria
Springfield
Champaign Urbana

Assembly Plants
Joliet

Projected completion date: May 1987

*Whether you're using plots made with a high-quality plotter like those from Hewlett-Packard or slides made with a 35mm-film recorder like the Polaroid Palette, you can create some colorful, expressive maps to display your data visually. **Top left:** All you'd need to plot this map with Map-Master would be boundary files for the world and your total first-quarter revenues for the international offices shown. **Top right:** This Atlas AMP plot includes highways, shown by the red lines, and a circle indicating a 7-mile-radius trade area encircling a Philadelphia retail store. This type of circle around an area is a unique feature of Atlas AMP. **Bottom left:** This Map-Master map of Texas shows the market share of individual counties, a typical breakdown for a state map. Note the dealer locations, shown by the large dots. Map-Master includes a number of icons that you can use to indicate map features.*
Bottom right: Since Diagraph is a business graphics package that includes many icons for charts and graphs as well as maps, the icons are more varied than those the standalone mapping packages supply. If you need to illustrate only a map outline with your comments and icons but not to analyze data or display data automatically on a map, one of the business graphics packages that includes maps can do the job.

Mapping Software: Summary of Features

	MAPIT	Polymaps	Map-Master	Randmap	Atlas AMP
Price	$95	$99	$395	$495	$449*
Memory required	128K	256K	340K	256K	320K
Requires hard disk			Recommended	Recommended	Recommended
Copy protected			●		
OUTPUT DEVICES					
Supports plotter for output			●	●	●
Uses printer for full map output	●	●	●	●	●
Supports film recorder		●1	●4	●1	In new release
Screen display	No†	●	●	●	●
MAP EDITING					
Zooms	●	●	●	●	●
Explodes	●		●		●
Sizes and positions map on screen			●		
Sizes and positions map on page	●	●	●		●
Overlays	●		●		●
Aggregates regions	●		●		●
Divides regions	●				●
DATA EDITING					
Imports ASCII files		●	●	●	●
Imports .DIF files			●		●
Imports SYLK files			●		
Enters/edits data	●	●	●	●	●
Computes with formulas			●		●
Uses conditional combinations			●		●
Sorts data			●		●
Reports			●		●
Exports data to .DIF and .PRN	●		●		●
TEXT, SYMBOLS, AND LINES					
Free-form text	●	●	●	●	●
Different text sizes			16		3
Adds circles around points			●		
Different fonts			3		In new release
Icons			94		In new release
Footnotes			●		
Control over text options			● by character		● by letter
LEGENDS AND RANGES					
No. of ranges	30	10	8	10	20
Replaces range labels with text			●		●
Dot-density maps			●	●	
Does bivariate maps			●		
No. of hatch patterns	N/A	14	8	4 +	300
No. of colors	30 (plotted)	8	8	10	16
BOUNDARY AND DATA FILES					
Includes boundary files	●	●	●	●	●
Offers additional boundary files, extra cost	●	●	●	●	●
Approximate price of some typical files	$95–$150	$100–$150	$95–$195	$200–$495	$500–$1,050
Includes data files	●	●	●	●	No**
Offers additional data files, extra cost		● populations only	●	●	●

N/A = Not applicable. *With ExpressMap, $499; Map-Edit, $249 (with Atlas, $149). †Not at present, but planned. **Yes with Express Map.

for each range. You can customize the legend heading. And the program allows you to combine standard geographic regions into custom regions that meet your specific needs; for example, your sales territory.

Map-Master's DataGrabber makes loading data files from a spreadsheet program like *1-2-3* easy. You can display and then grab all or part of the spreadsheet, load it into *Map-Master*, and then store it either with a map or with a variable library. Then you can use the data to map an area.

■ *Map-Master* **is an attractive package with an intelligent yet easy-to-master approach to mapmaking for business presentations.**

Once you've got all your data on the map, *Map-Master* offers options for positioning and sizing your maps, printing reports, printing maps on a graphics printer and on a plotter, and creating 35mm color slides using the Polaroid Palette. The manual even includes tips on slide making and instructions for loading film and shooting slides with the Polaroid Palette.

FREE NEWSLETTER When you purchase a copy of *Map-Master*, you get a free subscription to Decision Resources' newsletter, *Graphiti*. Much more than just a public-relations ploy, the newsletter is an excellent resource to help you improve your business graphics. A recent issue gave full-color examples of maps created with *Map-Master*, hints on improving your slide presentations, a user profile, a question-and-answer section, and an announcement of a new thermal-transfer printer for business graphics departments.

Map-Master's helpful menus demystify complex technical concepts with its down-to-earth language. Its easy-to-use features give you a wide range of options to create customized maps with all kinds of

data. And its well-designed manual is easy to use and informative. Perhaps what makes it even more desirable as an all-around mapping program is the fact that it includes, without extra cost, enough data for you to map the United States by number of population, age, income, and sales statistics. You'll undoubtedly want specialized boundary files, which you must order from Decision Resources, and certainly you'll want to add other data files—either from your spreadsheet program or prepackaged from Decision Resources—but *Map-Master*'s basic package gives you a head start.

Map-Master won't do bivariate mapping, where you include two different types of data on one map, and it lacks some of the more advanced data analysis and reporting features of its chief competitor, *Atlas AMP*. Bivariate maps aren't that much in demand, however, and *Map-Master* does perform conditional combinations of data. And, although you can't digitize a customized boundary file on your own, as you can with *Atlas*'s *MapEdit* program, you can make custom regions quickly, as A.C. Nielsen, one of *Map-Master*'s customers, does, by combining areas from boundary files. So if you are satisfied with your database and spreadsheet for more-elaborate data analysis and reporting, don't mind paying extra for the boundary files you need, and want a solid, presentation-oriented mapping program that's easy to use, you'll find that *Map-Master* is an attractive package with an intelligent yet easy-to-master approach to mapmaking for business presentations.

Randmap

Rand McNally means maps. You've been living with the company's maps all your life—from large pull-down classroom maps that captivated you in the fifth grade to detailed road maps that helped you wend your way through little-known byways across the country. Using its 130 years of expertise with maps to the fullest advantage, Rand McNally has produced *Randmap*, a direct but more capable descendant of its *Statmap* mapping program.
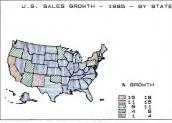
Totally menu driven, *Randmap* is easy to use, even if you're new to the PC. In minutes you can install the program and begin creating and modifying brilliant full-

U.S. SALES GROWTH - 1985 - BY STATE

% GROWTH

15	18
11	15
8	11
4	8
1	4

This Randmap plot places the United States to the side to accommodate the range legend. Note the five ranges, which have only a title and no text description to the side. The regions are not exploded because Randmap does not include that option. The map title is only one line long here, but you can use three-line titles if you wish. Slant names or abbreviations are not added automatically, and so they do not appear here. Zooming is an option, and you can also flip maps on either or both axes for better viewing on the screen.

color maps. But *Randmap* is not as flexible and full-featured as *Map-Master* and not as powerful and fast as *Atlas AMP*. Its new $495 price rescues it from the ignominy of being the most expensive PC mapping program on the market (it previously was $995, sometimes discounted to $795).

The *Randmap* package includes the main program, a utilities disk, and a files disk. The utilities disk contains the Rand-cat and Coords programs, which, respectively, catalog and then redisplay images created with *Randmap* and enable you to add new coordinate files for use in selecting specific geographic areas for mapping, as well as the device drivers for use with mice, printers, and adapters. The files disk includes boundary files of all 50 U.S. states and files for tutorials (but not interactive on-line), as well as other data files.

FEATURES *Randmap*, like *Map-Master* and *ExpressMap*, comes with boundary files of the U.S. states. Data options enable you to alter the minimum and maximum values in your map and to reset the number of ranges to correspond to the number of data value ranges you are mapping. Plus you can choose the method of dividing data into ranges. *Randmap* lets you use a saved range file and choose among several methods of dividing data into ranges. Although you can use only three lines for your map title, you can choose integer or decimal values for the data, enter names for range legends, use names or numbers, or suppress data range legends. When you're plotting your maps, you have another choice of options. Notable among what's missing is an explode option: you cannot separate parts of your map to illustrate data.

As with the other programs, you have a number of options when choosing the data for your map. Rand McNally may supply the data you need in one of its data files available at additional cost. If your company or organization has its own proprietary data to input, you can create your own user data file, with a single data field for each set of geographic codes. You can also use a *dBASE II* data file or a DIF (Data Interchange Format) file you've created with *VisiCalc*, *1-2-3*, or another popular spreadsheet program. You can display data from one of the above as geography, a

map legend, or as an optional line printer report.

CLEAR MANUAL Installing *Randmap* is fairly quick and easy since the manual takes you through the process step by step, even telling you how to create the necessary subdirectories on your hard disk and informing those new to computers how to care for floppy disks. The manual's 46 pages of tutorial material show you how to begin using *Randmap*'s features. The clear explanations of *Randmap*'s basic features, which experienced users might take for granted, demonstrate that Rand McNally wants the manager with no previous computer graphics experience to be able to use *Randmap* fast, with assurance, and with little effort.

After installing *Randmap* and configuring the program for your equipment, you can create a new map or edit a cataloged (or previously created and stored) map. *Randmap* has four catalogs that you can use to store your files: map specifications, data files, coordinate files, and image files. You can edit the first three types of files from the Update Catalogs menu.

Some of your options include extracting existing polygons to create a new coordinate file, merging two coordinate files, and flipping the coordinates in a file on the *x* or the *y* axis.

You edit the fourth type, image files, using the Ramdat Catalog Image Presentation System program. Similar to a photograph, a *Randmap* image file can be stored in a catalog so that you can then redisplay it at any time or assemble it in a slide show.

NOSTALGIA *Randmap* is easy to use and quick to learn. The manual is clear and good-looking, but an index would make it more helpful. The program can produce good-looking interpretive maps fairly quickly, but it offers less in terms of flexibility than *Map-Master* or *Atlas AMP*. It doesn't have an explode feature, icons, or italics and different type sizes for map titles. It doesn't have the advanced data-analysis features of the other two programs. But its additional boundary files—coming soon (fall 1986), for additional cost, of course—are tantalizing, including major lakes, rivers, and reservoirs; roads and highways; national forests and parks; Indian reservations; wilderness areas; and so forth. And if you're impressed by Rand McNally's 130 years in the mapping biz or feel nostalgic for your grade-school geography classes, when the world was smaller than it is today, you may want to request a demonstration of *Randmap*.

Atlas AMP

As the creator of the powerful *ExpressMap* system from Strategic Locations Planning (SLP), and developer of *Atlas AMP* (for Advanced Mapping Package) has many contented users in business, academic institutions, and government planning departments to its credit. In fact, it's the boast of Dun & Bradstreet's *BusinessTrac*, which allows marketing managers to access data from Dun's databases and then map the information.

On the market for about 2 years now, *Atlas AMP* is the best-known mapping package for the PC—and one with the most names to learn before you buy: there's *Atlas AMP* for $449; *ExpressMap*, for $499, which includes *Atlas AMP*; *DataEdit*, the data editor, free with any of the packages; *MapEdit*, the map boundary editor, for $249 ($100 off if purchased

with one of the packages); and *WorlData*, which also includes *Atlas AMP*, for $900. Wisely, SLP has developed a shell, or front-end, for its new version (September 1986); although *PC Magazine* hasn't seen it yet, the new user interface should make it easier to move from one program in the system to another.

If you are looking for a serious mapping program that gives you a lot of power and flexibility, need detailed data analysis as well as graphics capabilities, and are willing to put in some time getting to know all the features—you'd do well to explore *Atlas AMP*. It has pretty much everything the other packages offer and more.

Atlas AMP is function-key driven and has a function-key template to help you remember the primary uses of the keys. The program is really not as user friendly as it could be—until you add *ExpressMap*, which includes *Keyworks*, a powerful keyboard macro program from Alpha Software.

The maps you create with *Atlas AMP* are very impressive; lots of features, flexi-

bility, and choices give you great-looking maps on the screen and in hard-copy output. One difference in the way *Atlas AMP* maps look on the screen is that the map covers the entire screen, with the legend and ranges shown on another. When you print the map on a plotter, though, you'll get them both on one page. Although *Atlas AMP* doesn't as many options for labeling maps as *Map-Master* currently does, SLP says that different fonts as well as italics and underlining, plus user-placed icons, will be available in the new release.

U.S. BOUNDARY FILES *Atlas AMP* comes with some sample files plus boundary files for the United States; *ExpressMap* has more: various advertising and marketing divisions as well as demographic data variables. To draw other maps, you'll have to either create your own boundary and data files with SLP's powerful *MapEdit* boundary editor and *DataEdit* utility or purchase additional files from SLP, which sells an extensive library of both data and boundary files, the most popular of which

Sales Growth for 1985 by State

Total U.S. Sales were up by 14% in 1985!

Plotted on a Hewlett-Packard high-quality plotter, this map shows some of Atlas AMP's special features, notably the ability to add comments to areas in the map and to use a multiple-line title and a line at the bottom of the map. The legend, which shows the ranges, also has a title. Regions are "exploded," to show sales territory performance. Atlas AMP's September 1986 release will offer italics, different typefaces, and additional type sizes as well as icons, as Map-Master does. The state abbreviations are centered on the states, but you can suppress them, as was done for the small eastern states in this map; you can also move them to accommodate other features or labels.

Glossary of Mapmaking Terms

ADI Area of Dominant Influence. ADIs are marketing regions developed by Arbitron Ratings Co. and used primarily by the television industry. You can purchase ADI boundary files of the United States for mapping with data.

Boundary file A computer-readable file containing the outlines of geographic regions, usually designated by *x, y,* or latitude and longitude coordinates. Mapping software uses these boundary files to draw maps. Some vendors sell customized boundary files as well as standard ones. Interpretive maps require both boundary and data files.

Census tract A unit defined by the U.S. Bureau of the Census for gathering demographic data, usually including 2,500 to 8,000 residents, with homogeneous population and housing characteristics when established. You can purchase boundary files based on census tracts.

Data or statistics file A computer-readable file containing demographic and economic data for geographic regions. Each category in a data or statistics file is called a variable, examples of which are population, median age, and total income. Interpretive maps require both boundary and data files. Vendors of PC mapping programs usually sell data files for use with their programs but also allow you to enter or import your own data.

Digitizer or digitizing tablet A device used to generate a boundary file by physically tracing a paper map.

are its cities and highways, U.S. counties, and countries of the world files.

DataEdit enables you to display your own data and edit data from SLP. It takes DIF and the ASCII data files from programs like *1-2-3*, *VisiCalc*, and *dBASE II* and *III* and then outputs an *Atlas AMP* data and format file. The manual goes so far as to tell you how to create flat files with *dBASE II*. *DataEdit* also lets you calculate new variables using formulas and generate

DMA Designated Marketing Area. DMAs are marketing areas developed by A.C. Nielsen Co. and used primarily by the broadcasting industry. You can purchase DMA boundary files of the United States for mapping with data.

Explode The process of separating designated sections of a map from each other with white space to show more clearly the relationships or characteristics of certain areas. A useful feature of most mapping programs.

LATA Local Access Transport Area. LATA maps are perfect for showing telecommunications industry data. The United States has 195 LATAs. You can purchase these boundary files for mapping with data.

MSA Metropolitan Statistical Area. MSAs are groups of counties that encompass a densely populated area. An MSA may encompass a large city or one or more small cities. The United States has more than 300 MSAs. You can purchase MSA boundary files and data for MSAs for mapping.

SMSA Standard Metropolitan Statistical Area. SMSAs have been replaced by MSAs as the most current definition of metropolitan areas in the United States.

Zoom The process of enlarging a portion of a map (zooming in) or of shrinking the map (zooming out). A useful feature of most mapping programs.

—*Carol Olsen Day*

data reports with summary statistics. It's one of the most powerful features of the *Atlas AMP/ExpressMap* system. You can even use it to search and sort your data as you would with a database program, and it enables you to not only import your data from a spreadsheet or database, but to export it as well.
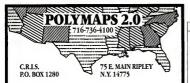
But remember: you still need boundary files with coordinates of the territory you want to map and display your data on. You

could create your own boundary files in ASCII format, but that could involve more time and effort than is practical, unless you're a mapmaker par excellence. The way out that most business users choose is to buy the additional files needed from SLP (which specializes in geographic data and analysis for marketing and strategic planning) and to create the data files they need themselves, especially since most companies will already have much of the data they need.

BOUNDARY EDITOR But if you do want to create or modify boundary files for use with *Atlas AMP*, you'll need SLP's *MapEdit*. This boundary editor makes *Atlas AMP* more powerful and more flexible but also more complex to use (its manual is about the same size as that for *Atlas AMP* itself). Using a joystick, a mouse, a digitizing tablet, or the cursor keys, you can customize *Atlas AMP* boundary files to meet your specific needs by creating your own files or by modifying boundary files purchased from SLP. As SLP warns you in the *MapEdit* manual, *MapEdit* is a complex program; you have to read two chapters and work through a 2½-hour tutorial just to get started, and you must be familiar with using *Atlas* first. Yet after a few hours of using the program, you'll find that it's an excellent tool for mapping your own territories and for customizing map colors, patterns, and position, as well as adding such features to your maps as circles indicating distance from a point, roads and highways, and sites. *MapEdit* also offers region aggregation and explode features.

SLIDES UTILITY *Atlas*'s Slides utility program is another handy feature; it allows you to store previously created maps and display them on your screen as an electronic slide show for demos or presentations. The new release will also support the Polaroid Palette, as *Map-Master* does, and other film-recording devices.

I personally wouldn't want to use *Atlas AMP* without the built-in macros of *ExpressMap*. I'd like to be able to escape a procedure quickly, too, without having to wait for *Atlas AMP* to put all the state names on the map when I've decided that I don't really want them. Also, I prefer

■ **MAP PROGRAMS**

Map-Master's clearer, slicker-looking manual (*Atlas AMP*'s manual has been re-designed for September release, but as of this writing, it wasn't available). As *Atlas AMP*'s manual points out, advanced PC mapping is a matter of power versus simplicity. *Atlas AMP* has the power first and the simplicity second. If you create maps only every few months when making presentations, you might not need all the capabilities of *DataEdit* and *MapEdit* or the speed and power of the *Atlas AMP* system. But *Atlas AMP* gives you more possibilities, especially with the improvements promised in the new version. If you want detailed data analysis as well as presentation quality, *Atlas AMP* might be the right stuff.

Carol Olsen Day is a frequent contributor to PC Magazine. *Her most recent book is* The New Immigrants *(Franklin Watts, 1985). Currently she also writes for network television.*

Micro-to-Mainframe Connections:

SNA REMOTE EMULATION

● ● ● ● ● ● ● ● ● ● ● ● ● ●

Communications between a PC and a mainframe in a remote location require terminal emulation boards and software dedicated to handling that connection. In our last issue, we discussed the differences between bisync and IBM's SNA (Systems Network Architecture) versions of the 3270 terminal and reviewed 7 bisync emulation packages (see "Micro-to-Mainframe Connections: Remote Possibilities," *PC Magazine,* Volume 5 Number 15). In this article, we will review 15 packages that emulate SNA terminals.

The difference between the SNA and bisync protocols is largely a matter of organizational preference. If your mainframe is already strictly tied to SNA, the products reviewed here will provide an able connection between the PC and that system. If your organization is contemplating the purchase of a new IBM mainframe, it will most likely require an SNA terminal, such as the 3270, or a PC that emulates that terminal.

Bisync environments still exist, but, as the proliferation of SNA emulation packages shows, a transition to SNA is proceeding rapidly.—**Bill Harts**

● ●
Communication between the PC on your desk and your organization's remotely located mainframe requires 3270 terminal emulation hardware and software. These 15 remote emulation products offer that capability under SNA, an increasingly popular protocol.

Remote 3270 Emulation Boards: Summary of Features

Product/Manufacturer	IBM PC 3270 IBM Corp.	BlueLynx 3270 Remote Techland Systems Inc.	pcPath SNA-3270 Pathway Design Inc.	ABM SC-327X/ SNA-1 ABM Computer Systems Inc.	AST-SNA AST Research Inc.	IDEAcomm 3270/RNA IDEAssociates Inc.	Molelink/ Plus Remote Quadram Communications Group
List price	$665	$795	$890	$895	$895	$895	$895
Terminals/controllers emulated	3274 Model 51C, 3278 Model 2, 3279 Model S2A	3274 Models 51C, 61C; 3276 Model 12; 3278 Models 2, 3; 3279 Models 2A, 2B	3274 Model 451C; 3276 Model 451C, 3278 and 3279 subset	3274 Model 51C, 3278 Model 2, 3279 Model 2A	3274 51C, 3278 Model 2, 3279 Model 2A	3274 Model 51C, 3276 Model 12	3274 Model 1C; 3278 Models 2,3,4,5; 3279 Models 2,3,4,5
Applications program interface	Optional	N/A	Standard	N/A	Optional	N/A	Optional
Type of Status Indicators	Characters	Characters and some symbols	Characters or symbols (user selectable)	Characters	Characters	Symbols	Symbols
Diagnostic program or trace routine	●	●	●	○	●	○	○
Maximum speed (bps)	4,800 to 19,200	19,200	9,600	9,600	4,800	9,600	4,800
Automatic dial support available	○	○	●	○	○	○	○
Internal modems supported	○	○	●	○	○	○	○
NRZI (Nonreturn to zero inverted) data encoding	●	●	●	○	●	●	●
File-transfer software	Optional	Standard	Standard	N/A	Standard	Standard	Standard
Types of Transfer Available							
Screen dump to file	○	○	○	○	○	○	○
Using TSO EDIT	●	●	●	○	●	●	●
Using CMS EDIT	●	●	●	○	●	●	●
CICS	●	●	●	○	●	●	●
Other	●	○	●	○	○	○	●
User-definable keyboard	●	●	●	○	●	●	●
No. of int'l layouts available	15	9	19	0	13	9	13

●=Yes ○=No ▣=Indicates Editor's Choice

IBM PC 3270

No vendor knows better than IBM what a 3270 emulator should look like, and so it came as no surprise that the IBM PC 3270 tested very well on our quality assurance test. But in exchange for getting the real thing—and at $665, a price well below average for this market—you have to do it IBM's way.

IBM doesn't bother taking the steps other vendors take to make their products easy to configure and use. While others hunt for gimmicks to make their products more acceptable, IBM seems to miss some obvious ways to simplify things.

To communicate with a remote main-

> ■ It came as no surprise that the IBM PC 3270 tested very well on our quality assurance test.

frame, you need to use an identification code, called the XID. This is an eight-digit code with two parts: the three-digit IDBLK tells that mainframe what kind of device

you are using or emulating (017 for 3274, 018 for 3276, or 03D for 3270 PC), and the five-digit IDNUM identifies your specific device (if you're using a real 3270 terminal or cluster controller, the IDNUM is the last five digits of that device's serial number; when you're emulating a 3270 device, you must ask the mainframe for an IDNUM). When I configured the PC 3270, I did not find a field in which to specify the IDBLK. This is because IBM, unlike most of the other 3270 terminal-emulation vendors, allows only an IDBLK of 017 (which means it allows only 3274 emulation) and does not let you enter that value.

The manual is difficult to use. It looks

Product/Manufacturer	SNA Exchange Intelligent Technologies International Corp.	SDLC PC Adapter INS Corp.	DataTeller PC+ Winterhalter Inc.	3270 PC Remote CXI Inc.	Clee PC2-3276/12 SNA Cleo Software	AdeptSNA 3270 and Adapt-/Modem Network Software Assoc.	Modem Exchange Intelligent Technologies International Corp.
List price	$895	$995	$1,095	$1,190	$1,595	$1,780	$1,995
Terminals/Controllers emulated	3274 Model 51C, 3276 Model 2, 3277 Model 2, 3278 Model 2, 3279 Model 2	3274 Model 51C, 3278	3274 Model 51C, 3276 Model 12, 3278 Model 2	3274 Model 1C, 3278 Models 2, 3, 4, 5; 3279 Model 2	3274 Model 51C, 3276 Model 2; 3278 Model 2, 3279 Model 2A	3274 Model 51C, 3276, 3278 Model 2; 3279 Model 2	3274 Model 51C, 3276 Model 2, 3277 Model 2, 3278 Model 2, 3279 Model 2
Applications program interface	Standard	N/A	N/A	Optional	Standard	Optional	Standard
Type of Status Indicators	Characters	Symbols	Symbols	Symbols	Characters	Characters	Characters
Diagnostic program or trace routine	●	●	●	●	●	●	●
Maximum speed (bps)	9,600	19,200	9,600	4,800	9,600	4,800 with internal, 9,600 with external	4,800 with internal, 9,600 with external
Automatic dial support available	○	○	○	○	○	○	○
Internal modems supported	N/A	○	○	○	○	●	●
NRZI (Nonreturn to zero inverted) data encoding	●	○	○	○	●	●	●
File-transfer software	Optional	Standard	Standard	Standard	Standard	Optional	Optional
Types of Transfer Available							
Screen dump to file	●	○	●	●	●	●	●
Using TSO EDIT	●	○	●	●	●	●	●
Using CMS EDIT	●	○	●	●	●	●	●
CICS	●	○	○	●	●	●	●
Other	○	○	○	○	IBM host-supported	○	○
User-definable keyboard	●	●	●	○	●	○	●
No. of int'l keyboard layouts available	19	21	0	13	0	0	19

and reads like a standard IBM PC reference manual (that is, so technical that it barely reads like English), but that's not enough when you're trying to install a product. Even with this weakness, the documentation is up to the usual high standards of IBM documentation and does contain hints on where to start and where to go for specific information.

NO TIME-SAVING KEYS Even though several things were not quite problems, they bothered me just the same. In the configuration program, everything is done with menus, but to select from the menus you must enter a letter instead of positioning the cursor. IBM seems to have forgotten to use the time-saving cursor-control keys.

Placement of the Enter and New Line keys is also awkward. Many vendors move the Enter key from its traditional 3270 position (somewhere near the PC's Ins key) to the standard PC Enter key position. While this may confuse 3270 operators who switch to PC's, it will not confuse PC users who implement 3270 terminal emulation. IBM puts the Enter key on the numeric keypad's 1 or End key and changes the PC's Enter key to a New Line key. You can imagine how many times, out of habit, I hit the PC's Enter key and

waited for something to happen, when I'd meant to hit the 3270 Enter key.

You can change this arrangement by reconfiguring the keyboard, but IBM doesn't make that easy either. To reconfigure the keyboard, you must create a file with an editor (IBM recommends EDLIN, but I do not) and have that file available when you call up the keyboard reconfiguration facility. Why does IBM use this cumbersome system when many better ones are available?

A third aggravation was the lack of an audible alarm to notify you when you make a mistake. Typists who look at the keyboard and not the screen can enter a lot

■ MICRO TO MAINFRAME

PC MAGAZINE FACT FILE

IBM PC 3270
IBM Corp.
Box 1328-W
Boca Raton, FL 33429-1328
(305) 999-2000
List Price: $665
Requires: 256K RAM, DOS 2.10 or later.
In Short: The lowest-priced remote 3270 terminal emulator that will do windows. File transfer software and Application Program Interface (API) are bundled with the product. Support is obtained from the dealer or distributor, not the vendor.

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of data and later find that it was not sent to the mainframe at all.

The IBM PC 3270 is the only product I have seen that has an IBM-compatible Application Program Interface. A look through the overtechnical manual convinced me, however, that this feature is best left to experienced mainframe systems programmers. —Charles Teets

BlueLynx 3270 Remote

Techland Systems' BlueLynx 3270 Remote was presumably named to evoke the image of an exotic cat, thereby surrounding the product with a mysterious allure. There's even a little blue lynx on the front cover of the manual. Somehow, this ploy works. Something about the packaging grabbed my attention.

Of course, BlueLynx is also a pun. On a more prosaic level, the BlueLynx 3270 Remote is a half-card board that's painted blue and links your PC to a mainframe. Its features include locally supplied color support, a "hot key" for shifting between DOS and the mainframe, and support for

up to five concurrent sessions—three displays and two printers. File transfer is standard as well but limited. You can upload a file from disk; downloading is restricted to screen dumps and redirecting printer output to a file.

On basic tasks, the BlueLynx 3270 Remote performs as nicely as you could want. It handled the PC Magazine Labs emulation tests with ease, missing out only on the advanced attributes that it doesn't claim to support, such as blinking, reverse video, and underlining.

The keyboard layout is, to be kind, innovative, with the New Line function mapped to the PC's Enter key and the Enter function mapped to the PC's End key. This arrangement is likely to confuse 3270 users who are used to finding the Enter key at the PC's PrtSc position. It is also likely to confuse PC users, who are used to using the Enter key as the Enter key.

Although the basic package comes without a keyboard redefinition module, one is available for the asking, as are nine international layouts. If you order BlueLynx, I strongly suggest you request the module immediately.

One keyboard asset is BlueLynx's 3270 "hot key," which, unlike on some emulators, works in both directions, letting you shift from a DOS application to the mainframe without having to drop to DOS level first.

MANY OVERSIGHTS Unfortunately, this promising package has too many oversights to ignore. To start with, the BlueLynx board and software are preset for interrupt level 2, which is probably the most likely to conflict with other, more common options in a PC. Hardware and software are both easy enough to change, and the manual includes a thorough explanation of how to do that, but on the issue of whether to change them, the manual's advice is "Don't worry. Your System Manager will know . . ." That seems optimistic; the manual should give more specific advice or invite users to call Techland for help.

A more serious problem is that the manual doesn't have enough in common with the package I reviewed. Techland sells an optional keyboard for BlueLynx, and the manual is written specifically for the key-

■ MICRO TO MAINFRAME

board. This arrangement leads to instructions like, "Jumping back and forth . . . between the LU's . . is simply a matter of pressing the [Jump] key to go forward . . . and the [Alt][Jump] combination to go . . . backwards." Of course, there is an equivalent key on the PC's keyboard, but the manual doesn't tell you which key it is, nor does the Jump command show up on the keyboard layout card. I finally tracked down the proper commands—Ctrl-Q for forward and Ctrl-W for backward—by systematically trying each Alt and Ctrl key combination until I found the ones that worked.

According to Techland Systems, most of these oversights will be fixed in Release 2.6, which had just been announced at the time of this review. In particular, the manual has been rewritten to take the PC keyboard into account. Changes in the program itself are minor but include a user-definable timeout feature, additional drivers to accept more kinds of printers, and the ability to define the colors the program uses for various fields.

Release 3.0 is under development as

FACT FILE

BlueLynx 3270 Remote
Techland Systems Inc.
25 Waterside Plaza
New York, NY 10010
(212) 684-7788
List Price: $795
Requires: 128K RAM, one 160K disk drive, DOS 2.1 or later.
In Short: Great potential paired with numerous oversights make this product a mixed bag, but Techland promises to correct the errors and add new features in two upcoming releases.

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well and may be available by the time you read this. A Techland representative says that rather than replacing Release 2.6, Release 3.0 will sell alongside it as a top-of-the-line product, with extra features and functionality.

This news leaves me cautiously optimistic about the BlueLynx. The current Version 2.5 does a competent job of 3270 emulation, but it's not the sort of product that sets standards for others to follow. If Versions 2.6 and 3.0 correct the problems and add enough new features, this will be a far more interesting package.

—M. David Stone

pcPath SNA-3270

Pathway Design's pcPath SNA-3270 communications package uses the same hardware as the bisync version, and its software has a nearly identical look and feel. The manual sports the same clear writing and professional design layout. The fact that the bisync version was an easy pick for Editor's Choice (see "Micro-to-Mainframe Connections: Remote Possibilities," _PC Magazine_, Volume 5 Number 15) bodes well for the pcPath SNA-3270.

Of course, SNA is a different world from bisync, and this package needs to be looked at from a different perspective. In particular, the feature that caught our attention in the bisync package—the ability to manage multiple concurrent sessions on the mainframe—is rare in bisync emulators but common in SNA packages.

The pcPath SNA-3270 handles multiple sessions the same way as the bisync version does, and both can manage up to five concurrent sessions. As many as three of these can be print sessions, and each print session can actively print to disk in background while you work on something else.

Each session uses the whole screen. You can see only one session at a time, flipping from one to the next in round-robin style with Alt-F10. While this approach is satisfactory for most applications, it is somewhat limited compared with emulators that show multiple sessions on-screen simultaneously, each in its own window. It's also less than ideal when compared to emulators that let you switch directly to any logical unit rather than having to move

through each one in turn. With only five LUs, that's not much of a problem, but call this feature about 80 percent right.

HOT-KEY CAPABILITY The pcPath SNA-3270's "hot key" capability more than makes up for any shortcomings in multiple sessions. Most 3270 SNA emulators have some form of hot-key feature for switching to DOS without ending the mainframe session, but in many cases the only way to get back to the on-line session is to drop to DOS level and type a command like EXIT. The pcPath SNA-3270 uses the two Shift keys as hot keys in both directions. You can, for instance, run a word processor or spreadsheet in DOS and freely switch back and forth between mainframe and DOS application.

Most other features of the pcPath bisync version also fare well in their translation to the SNA version. Hardware installation is almost trivial, and in most cases you only have to plug in the board. Should you need to reset the jumpers, it's easy to find the necessary technical information in the manual. Failing that, you can call Pathway

Design's customer-support hot-line 800-number for help.

To install the software, you have to know the settings that the mainframe wants to see, but the installation itself is straightforward. It includes several nice touches, like letting you define each logical unit separately to use either text or graphics characters in the status line.

If you have a color monitor, pcPath will provide different colors for four kinds of fields, even though the mainframe thinks it's talking to a monochrome terminal. The defaults match the standard 3279 settings—green for unprotected normal intensity, red for unprotected normal intensity, blue for protected normal intensity, and white for protected intensified. The installation program lets you define the colors yourself from a palette of 16 choices. You can even define different colors for different logical units.

As shipped, pcPath SNA-3270 defines the PC's Enter key as Enter and uses the PgDn key for the New Line function. The PF keys run across the top two lines of the keyboard, with PF23 and PF24 spilling over into the third line. If you don't like this arrangement, you can redefine the keyboard as you like using the installation program. And if you misplace the layout chart, you can use on-line help to get a list of current key assignments.

Like the bisync version of this product, the pcPath SNA-3270 handled the emulation tests without a hitch, missing out only on such items as blinking fields, reverse video, and other advanced attributes that Pathway doesn't claim to support. The testing procedure did not include file transfer, but the pcPath offers three choices as standard—TSO EDIT, CMS XEDIT, and CICS. (The package requires the standard IBM software on the mainframe.)

One missing feature worth mentioning is 3770 emulation for batch processing. While this capability is over and above standard 3270 emulation, I've run into it in enough other products to notice its absence here. A 3770 package is available as an option for $595.

pcPath SNA-3270 is very nearly as impressive in its SNA incarnation as in its bisync version. If you're looking for an SNA emulator, pcPath belongs high on your list. And if you need both SNA and bisync capabilities, you may not need to look any further.—M. David Stone

ABM SC-327X/SNA-1

I took the ABM SC-327X/SNA-1 board out of its protective cover, took one look, and put it right back. The 49 little jumper-plug locations gave me pause. Fortunately, only about 20 of them were filled. After

I regained my composure, I looked a little closer and found that ABM had used jumper plugs to enable or disable all of the RS-232 signals. Other vendors use the more familiar DIP switches, which look like normal chips with wire straps over them. There's no problem with the way ABM designed its board, but it could take several years off a person's life to see all those jumpers.

Actually, the documentation is a little confusing when it comes to setting the jumpers. Good diagnostics ease the situation somewhat: if you set the jumpers incorrectly, the diagnostics will probably lead you to the cause of the problem. More-specific documentation for the diagnostics would solve even more problems: the documentation gives four general areas to check for failures but does not provide any explanation of those failures. The diagnostics have to be run from BASIC (most diagnostics are compiled C or assembly language, but to each his own), which may distress users who are not familiar with that language.

The documentation is printed on 8½

At last! - Fast, On-screen

FLOWCHARTS
And Organization Charts

Finally! An on-screen flowchart processor that knows about flowcharts and organization charts - not just another "screen draw" program that makes you do most of the work.

Interactive EasyFlow is a powerful full-screen graphics program dedicated to flowcharts and organization charts. With this program you can quickly compose charts on the screen. More importantly, you can easily modify charts so they are always up to date.

Features: ● Text is automatically centered, character by character, within shapes as you type it ● Text formatting controls allow you to over-ride the automatic formatting where desired ● Lines are created by specifying the starting and ending points - the program automatically generates the route ● Powerful editing facilities allow shapes and even entire rows and columns of shapes to be inserted or deleted; lines are automatically re-routed as necessary ● Large chart size (up to 16 shapes wide by 16 shapes high) allows very large flowcharts and organization charts to be handled with ease ● Charts can be larger than the screen - the window into the chart scrolls both horizontally and vertically as necessary ● Flexible printer interface allows it to work with all
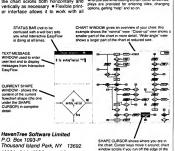
printers, not just dot matrix printers. Wide charts can be printed in strips Also works with Hewlett-Packard 7475A (and compatible) plotters ● Twenty standard flowcharting shapes included ● Common shapes supplied in three sizes ● Extensive manual (125 pages) includes many examples ● Context sensitive "help" facility provides immediate assistance at any time ● Any number of titles can be placed on a chart ● Commentary text blocks can be placed anywhere in the chart ● Fast - written in 8088 assembler ● Plus many more features than we can mention here.

Requires at least 256K memory, DOS-2 or higher and an IBM or Hercules compatible graphics card.

Order direct for only **$149.95** + $2.00 S&H (USA/Canada), $10.00 (foreign). Payment by MO, check, VISA, COD or Company PO. Rush orders accepted ($15.00 S&H; USA/Canada only). Rush orders received by noon will be delivered the next business day (to most locations).

The sample screen display shown below is typical of what you see while editing a chart. Other screen displays appear for entering titles, changing options, getting "help" and so on.

STATUS BAR (not to be confused with a new bar) tells you what Interactive EasyFlow is doing at all times.

CHART WINDOW gives an overview of your chart; this example shows the "normal" view. "Close-up" view shows a smaller part of the chart in more detail. "Wide-angle" view shows a larger part of the chart at reduced size.

TEXT/MESSAGE WINDOW used to enter user text and to display messages from Interactive EasyFlow.

CURRENT SHAPE WINDOW - shows the content of the current flowchart shape (the one under the SHAPE CURSOR) in complete detail.

SHAPE CURSOR shows where you are in the chart. Cursor keys move it around; chart window scrolls if you run off the edge of the window.

HavenTree Software Limited
P.O. Box 1093-P
Thousand Island Park, NY 13692
(613) 544-6035 ext 49

■ **MICRO TO MAINFRAME**

by 11-inch sheets that have been photocopied and reduced. These clumsy pages are difficult to read and make the configuration process even more frustrating.

No two people can agree on how an IBM 3270 terminal keyboard should be configured. Fortunately, the default keyboard is reconfigurable. ABM's presentation of the reconfiguration capability is attractive: you choose the keys you want to change from an on-screen layout of the keyboard, on which all of the keycaps are numbered.

The first SC-327X/SNA-1 board I tried did not work. A cooperative ABM technical person helped me to determine that I had a bad board and sent a replacement that worked properly.

Unlike ABM's bisync board, this package does not include any file-transfer utilities—you must buy them separately. For some users, this omission will render the SC-327X/SNA-1 an expensive alternative to the "dumb" terminal it is replacing.
—*Charles Teets*

AST-SNA
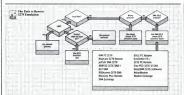
AST-SNA is a mixed bag. Its attractive features include the Application Program Interface (API) and good file-transfer software, but it does not do windows and only allows you to emulate one terminal (additional PCs can communicate with the mainframe through an AST cluster controller product that works within local area networks.)

The documentation comprises three manuals with heavy cardboard covers in a hard-case binder. I would have liked to see tabbed dividers between manuals and slightly different tabbed dividers between chapters within the manuals.

AST's CC-432 board serves for SNA and bisync emulation. Users who need both types of links can use this board for both to reduce costs. The board has its own manual and includes good diagnostic routines.

The default interrupt request was set to 2, as is the case with all of AST's 3270 communications products and with some other 3270 terminal emulators. While many vendors claim that this is a reserved interrupt request, too many use it, often creating conflicts within the PC. You can

A remote 3270 emulator board can link your PC with a mainframe at a remote site. The products reviewed here work with mainframes running the protocol.

and probably should change the interrupt request at initial installation time to avoid such problems.

The keyboard layout is unusual and difficult to use. The 3270 PF key tasks are assigned to the PC's function keys, and other special keys are located on the top row of the PC's keyboard. The keyboards on most of IBM's 3270 terminals reverse these assignments. You can correct the positions by reconfiguring the keyboard, but I found the keyboard reconfiguration process cumbersome because AST does not give you on-screen examples of the keys. You have to use your memory or rely on the manual.

AST-SNA does not support programmed tabs. While this is not a serious omission, it would bother users who run CICS applications with formatted screens, and it could cause problems for mainframe programmers who are trying to make applications quicker and easier to use. AST Research claims to be working on this problem.

The file-transfer software and documentation, which are the same as those provided with the AST bisync package, let you transfer data from the PC to TSO or CMS environments on the mainframe. Although this is a slower method than some of the more-sophisticated PC-to-mainframe applications use, it is easier to install and use and does not require additional mainframe software. Once you have logged on to CMS or TSO and are at the Ready prompt, you initiate a transfer by

"hot keying" to local mode and then executing the file-transfer program.

The AST-SNA's API allows BASIC, C, or any language that supports assembly language modules to capture and insert screen data. This feature adds flexibility for programmers who want to integrate applications with 3270 remote communications.—Charles Teets

IDEAcomm 3270/SNA

Like most IDEAssociates terminal emulators, the IDEAcomm 3270/SNA is heavily oriented toward technical users. These users will just love the heavy technical wording of the manual and the *WordStar*-like mapping of the keyboard, which uses the Ctrl key in conjunction with letters to emulate special 3270 keys. For example, Ctrl-R is for Reset, Ctrl-Z is for Clear, and Ctrl-E is the "hot key" that takes you into local mode.

I had already installed the IDEAcomm 3270/BSC emulation board, so installing this one was a breeze. Both packages use the same board, and you don't have to change switch settings. If you need both bisync and SNA remote access, this feature is handy. Software installation and configuration are also the same for both products; I did not have a manual for the SNA package, but I was able to use the bisync manual for some procedures and fake it for the rest. According to IDEAssociates, the manual for the SNA software is similar in style to the manual for the board itself, which means it is well laid out and packaged in a standard IBM-size folder.

Like the IDEAssociates 3270/BSC emulator, the SNA version does not include keyboard templates. To orient yourself, you have to keep the manual open to the page that shows the keyboard layout. Since I'm not a great fan of *WordStar*-like commands, I took a close look at the keyboard reconfiguration capability. This is a nicely designed feature: you look at a diagram of the keyboard with a number on each key, you choose the numbered key you want to change, and it is indicated on-screen. This intuitive process makes keyboard reconfiguration much smoother than it can be with other products.

The IDEAcomm 3270/SNA's file-transfer utility is somewhat primitive. You can create screen images off-line and use this utility to send those images up to the mainframe. Whatever happened to the slick, sophisticated utilities that would convert file types and automatically translate data in either direction? When it comes to file transfers, this product does little more than the dumb 3270 terminals it emulates.

The first time I examined an

■ MICRO TO MAINFRAME

PC MAGAZINE FACT FILE

IDEAcomm 3270/SNA
IDEAssociates Inc.
35 Dunham Rd.
Billerica, MA 01821
(800) 257-5027
(617) 663-6878 (in Mass.)
List Price: $895
Requires: 128K memory, one disk drive, DOS 2.0 or later.
In Short: A great choice for technical users who like WordStar commands. Compatibility with the bisync version of the product makes the IDEAcomm 3270/SNA appealing if you need both bisync and SNA mainframe links.

CIRCLE 613 ON READER SERVICE CARD

IDEAssociates 3270 emulation package, I was shocked at the highly technical, difficult nature of the product. I still think beginners should stay away, but as a technical person myself, I've found that the IDEAssociates approach has begun to grow on me. Once you overcome some of its little quirks, such as the keyboard, you're likely to find these products nice to use.—**Charles Teets**

3270 PC Remote and Mainlink/Plus Remote

CXI has another one of those products that provide multiple 3270 session windows along with notepads and a DOS window. The first one of these I looked at was the IBM PC 3270 adapter, and just like IBM's CXI's 3270 PC Remote restricted me to acting like a 3274 cluster controller. In fact, in many ways this product, even though it's more expensive, offers functions similar to those of the IBM PC 3270. Products that provide 3270 SNA/SDLC

windows are restricted to 3274 emulation because the Distributed Function Terminal (DFT) mode that allows 3270 windows works only with 3274 cluster controllers. The fact that this product does such a good job of emulating a sophisticated device is a poor excuse for limiting its functionality. CXI should be able to design an expansion board and software that can emulate all types of IBM 3270 cluster controllers.

During our quality assurance test, I noticed that the 3270 PC Remote has an annoying little habit: it displays the first frame of a screen and then waits until it receives all other frames before displaying the remainder of the screen.

Another little problem surfaces when you enter numbers into fields on some of the screens. Once in a while, the emulator is slow in placing the numbers in those fields because it is updating the line and column fields on the status line. It beeped at me even though I am a slow typist—I hate to think of what would happen to a really fast typist.

Two versions of file transfer are available with this package. The simpler basic version allows transfers using CLIST under TSO and XEDIT under CMS. These transfers tend to be slower but easier to use than the advanced versions, which use

host-based software to speed up the transfers but also require more mainframe expertise.

All transfers are initiated by switching to the DOS screen and running a program

called FTP. Several files provided with the emulator should be uploaded to the mainframe first to make the transfers a little easier and more efficient.

Application Program Interface and keyboard customization software are provided on disks included with the 3270 PC Remote. Also thoughtfully included is a modem cable, which many users will appreciate. It could help them avoid wasting time searching for a cable to connect the emulator to their modems.

Evaluating Quadram's Mainlink/Plus Remote evoked a feeling of déjà vu, and for a good reason. CXI makes this product for Asher Technologies, which in turn provides it to Quadram. (Asher and Quadram are owned by the same company.) The emulation board is identical to CXI's 3270 PC Remote, the manuals are very close, and only a few of the files on the four disks have been renamed. The big difference is price: CXI's 3270 PC Remote costs several hundred dollars more than Quadram's Mainlink/Plus Remote.

Asher Technologies just put new covers and title pages on the manuals to come up with its own version of the documentation. CXI's program names started with 3274 to denote a cluster controller, but in the Quadram version the program file names started with 3278, a curious reference to local terminals. The differently named programs function identically to the CXI programs.—Charles Teets

Modem Exchange and SNA Exchange

Intelligent Technologies International Corp.'s Modem Exchange and SNA Exchange are not quite identical twins. As the names imply, the Modem Exchange includes a modem; the SNA Exchange does not. This is the major difference between them.

The SNA Exchange is a bit longer than a half card, while the Modem Exchange is full size. According to an Intelligent Technologies spokesman, the emulator hardware is the same in both cases. The extra real estate on the full-size board is taken up by the 208 A/B modem.

The sets of programs software provided with the two packages have an identical look and feel; in fact, one set is a slightly rewritten version of the other. Both packages also include software for 3770 RJE emulation.

Installation is reasonably straightforward for either version. The boards' jumpers and DIP switches are preset to work in most systems, and so you can probably plug the board into a slot and forget about it.

Unfortunately, if the settings conflict with other options in your system, you might need help correcting them. As with the bisync version of this package (see "Micro-to-Mainframe Connections: Remote Possibilities," *PC Magazine*, Volume 5 Number 15), the manual hasn't caught up with changes in the boards as yet. The Modem Exchange manual, for example, identifies the IRQ jumper as "the tall blue jumper on the edge of the board." In reality, the jumper is black, it isn't any taller than any other jumper on the board, and it's located above the edge connector, not on the edge itself.

Problems like this can be easily cleared up by a quick call to Intelligent Technologies (which maintains a toll-free technical-support line), but it would be better to avoid them in the first place.

The Modem Exchange manual contains at least one important oversight. The Modem Exchange board can use either its on-board modem or an external modem connected to its serial port. What's more, the package is smart enough to look to its serial port, check for an external modem, and then use the external modem if it finds one, or stay with the on-board modem if it doesn't.

This important feature gives you the option to use another modem protocol besides the 208 protocol, but it's not mentioned in the installation section of the manual or anywhere else, as far as I could tell. I only found out about it by calling Intelligent Technologies and asking what the DB-25 connector was for. You can't fault a company for adding new features to a product, but it's silly to add features without telling users about them. An Intelligent Technologies spokesman says that the manual is currently being rewritten to correct this and other deficiencies.

SOFTWARE INSTALLATION In the bisync version of this package, ex-

tremely simple software installation makes up for any confusion the hardware settings might cause. The main menu in the configuration program offers choices, each of which lets you change settings in an intuitive way.

Four of the main-menu choices deal with extras rather than essentials: Keyboard Mapping (for redefining the key-

> ■ The Modem Exchange
> is smart enough to look to
> its serial port, check
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> and then use it.

board layout), Color Mapping (for choosing colors for different fields), Printer Parameters (for creating new printer drivers), and Alternate Character Set (for choosing among the 19 international layouts). You can ignore all four until you're more familiar with the system.

To get this package up and running, the only main-menu choices you need worry about are device assignment and communications parameters. The first submenu lets you define each logical unit as a display or printer. The second lets you specify the hardware settings for the board and the settings the mainframe needs for physical unit address, cluster type, and terminal ID. If you enter these correctly, you should have no trouble talking to the mainframe.

Unfortunately, a software bug makes entering the values correctly more difficult than it should be. In making my device assignments, I set the software for five CRTs and no printer. The configuration program accepted this without objection, but the emulation software locked up immediately on loading.

It took three calls to technical support, plus a second board shipped overnight, before I found someone who immediately recognized the problem as a known bug and told me to add a printer to the device assignments. It seems that the emulation software chokes on five displays, but the program doesn't check for this.

Intelligent Technologies plans to fix the bug on the next release, but what this incident reveals about the company's technical support is troublesome. Callers should not have to depend on luck to find someone who actually knows about a known bug.

Once the problem was solved, the emulator breezed through all of the PC Magazine Labs emulation tests—including those tests that gave trouble to the bisync version of the package.

The modem version of the board comes with auto-dial software as standard. This separate module dials the phone, waits for the modems to establish contact, then hands control over to the emulation program by means of a batch file. The program includes a phone book complete with a search feature, and it will let you auto-dial, auto-answer, dial from the keyboard, or dial manually. This same module is an optional extra for the SNA Exchange and will work with the UDS external 208 A/B, 208 B/D, and 208 M/B modems.

As I've mentioned, the configuration program will let you choose colors for the emulation program to use. The color-mapping option lets you define colors for normal and high intensity in protected and unprotected fields. A nice feature lets you define numeric fields differently than alphanumeric fields. You can also define colors for the status line.

OTHER FEATURES Many of the features on the SNA Exchange and Modem Exchange are identical to their equivalents on the bisync version of this package. The hot key, for example, shifts into DOS with Alt-D but will not let you shift back to 3270 emulation from within a DOS application. Instead, you have to type EXIT at the DOS command line.

The keyboard is also the same as in the bisync package. The default layout assigns the 3270 PF-key tasks to the ten PC function keys—unshifted, shifted, and in Alt-key combinations. The New Line function is mapped to the Enter key and the Enter function to the PrtSc key, which 3270 users may like but which will certainly confuse PC users. However, with the keyboard-configuration program you can easily change any key assignments you don't like. Intelligent Technologies has

thoughtfully provided a blank keyboard template on the back side of the standard template, so that you can fill in your personalized layout.

All file-transfer capabilities are optional, at $395 for a screen dump feature, $500 each for TSO edit or CMS XEDIT, and $2,000 for CICS. (These prices include tapes for the mainframe side of communications.)

The SNA Exchange half-card is the same board that's in the Bisync Exchange package. In fact, you can use the same hardware for bisync and SNA, simply by getting additional software—at $595 for the SNA software or $650 for the bisync software. This arrangement may interest you if your mainframe is using bisync now but may switch to SNA in the near future.—**M. David Stone**

SDLC PC Adapter

The simplicity and flexibility of INS's SDLC PC Adapter make it an outstanding product, despite several problems.

> ■ The design of the
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The design of the SDLC PC Adapter board surprised me—it has no switches or jumpers to complicate the installation process. Setting up the software was not much harder: you copy the emulator program along with the configuration program for the keyboard you want, and the subdirectory on your hard disk is set up and ready to use.

The configuration program comes in 17 different flavors to accommodate 21 international keyboard layouts. These configuration programs use 9 languages for its screens and are closely tied to the 18 differ-

ent keyboard templates. This may not be the most thrilling aspect of a 3270 terminal emulation package, but it is helpful and somewhat unique: although many vendors provide international keyboard layouts, few of them provide international configuration programs and international keyboard templates.

While not difficult to use, this configuration program did have one confusing aspect. The IDBLK and IDNUM that make up the XID on the mainframe add up to eight digits. The INS configuration program asked for ten digits; to fill up the space I experimented with putting trailing zeros in the field. I was wrong—they should have been leading zeros—but the INS support person was very helpful. He must have run into this problem several times before because he knew the answer immediately. He assured me that this error will be fixed in a future release.

WRONG DEFAULT The other problem I ran into could be more serious for some

users. There are two parameters called pacing parameters in the Physical Unit (PU) description of the Network Control Program (NCP), which runs on your 3705 or 3725 front-end processor. The default value for these pacing parameters is 1, but the SDLC PC Adapter supports only a value of 0. Again, this problem will be resolved in a future release. I was lucky to have access to an experienced telecommunications systems programmer who changed the pacing values for me on the fly, but you can accomplish this only if you are accessing the mainframe through a valid switched (dial-up) configuration, as we were. If you're using leased lines, you're out of luck.

I found a disturbing omission on the SDLC PC Adapter's keyboard. The PC's CapsLock key is used as the Reset key—a very important 3270 key that lets you unlock your keyboard if you enter an incorrect keystroke—but the CapsLock function is not assigned to any key. You can reconfigure the keyboard to retrieve the missing Caps Lock, but that can be a difficult and cumbersome process. You must constantly look up reference numbers for the keys when trying to change the function of these keys.

I was also surprised to see that the board had a female connector on the modem cable. While this is standard for most data communications products, it is not standard for IBM PCs and compatibles. Fortunately, the vendor will supply a cable.

To transfer files with the SDLC PC Adapter, you switch to an alternative screen and use INS's versions of TSO and VM/CMS file-transfer software. At $25 for each version of mainframe transfer software, this is one of the best deals going. While adding little burden to your budget, this vendor-supplied software transfers data much faster than TSO EDIT or CMS XEDIT.—**Charles Teets**

DataTalker PC+

The DataTalker PC+ from Winterhalter comes with *CalcTran*, a file-conversion program for use with its file-transfer software. *CalcTran*, which can convert files into or out of *1-2-3*, *Symphony*, *VisiCalc*, *dBASE*, *Multiplan*, or BASIC formats, can be very useful even when you are not using 3270 terminal emulation.

The DataTalker PC+ board is not difficult to install, but I was a little disturbed to find that I could not change the interrupt request. This product uses IRQ, which may conflict with the COM:2 port on your PC. Software installation is a breeze: after you answer a few questions about the optional software you plan to use, the rest of the process is automated.

You can select screen colors during the configuration process, and I would recommend that you change them to the standard 3270 colors of cyan, white, green, and red. The default color scheme uses brown,

which looked like mud on my screen for the unprotected normal-intensity fields, which are usually green.

Two serious omissions emerged during testing. The DataTalker PC+ package lacks a keyboard template, and so you'll have to use the description of the default keyboard in the manual. This is a cumbersome way to work with a 3270 terminal emulation program.

The lack of an audible alarm to alert you when you make a mistake will disturb you if, like me, you are a below-average typist and need to watch the keyboard when you type. Errors in 3270 data entry lock the keyboard, and you won't be aware that your data is not being accepted.

You can attach an additional PC to act as a 3278 or 3279 display station. The second PC is connected through a separate cable from the DataTalker PC+ card, and it requires slightly different software.

File transfers can be performed by hit-

> ■ The DataTalker PC+ is not difficult to install, but I could not change the interrupt request.

ting the Command key—a sort of "hot key." These transfers, which use EDIT under TSO and XEDIT under CMS, are a little slow but easy to implement and use.—**Charles Teets**

Cleo PC2-3276/12 SNA

Cleo Software's SNA remote emulation board, the Cleo PC2-3276/12 SNA, comes with its own 2,400-bit-per-second modem called SyncModem. Although I could not

use the SyncModem in this evaluation (I needed 4,800-bps communications), an auto-dial modem like this one is a welcome addition to such a product.

The SyncModem has one quirk that could cause problems for some users: the RS-232 connector on the back side of the card is a female connector like the ones found on most modems and non-PC terminal devices. The PC has a male connector, and most users have cables that will not work with this card. Fortunately, I had a cable with male and female connectors on each end. Although the SyncModem has telephone jacks and an RS-232 port, an additional PC can only be connected through another COM port on your PC.

The Cleo PC2-3276/12 SNA board is interchangeable with the Frontier Technologies ADCOM-2 board, which Cleo sent us with its bisync package. Either board will work with either product.

During the installation process, the pro-

DataTalker PC+
Winterhalter Inc.
3796 Plaza Dr.
Ann Arbor, MI 48104
(313) 662-2002
List Price: $1,095
Requires: 128K RAM, DOS 2.0 or later.
In Short: One of the Winterhalter's extensive line of terminal emulators and protocol converters. Comes with *Cofe/Tran* software that can convert files to and from 1-2-3, Symphony, VisiCalc, dBASE, Multiplan, or BASIC formats.

gram asked me for the type of controller (3274 or 3276) rather than the three-digit ID block. While this approach may be easier for inexperienced users to understand, it could create confusion for users who have been given very specific instructions by their company's mainframe communications expert.

Cleo's keyboard configuration is not unusual or hard to use, which is fortunate for two reasons: the keyboard template is small and difficult to read, and there is no way to reconfigure the keyboard. The latter is a crucial omission because keyboard reconfiguration is an important aspect of a 3270 terminal emulation package because no configuration pleases everyone.

Cleo provides simple file-transfer capabilities; advanced file-transfer software is also available but priced separately. The simple file transfers, which work with TSO EDIT and CMS XEDIT, are slower than the more advanced transfers. Those advanced file transfers take advantage of host-based software to speed up the rate of transfer.

A limited Application Program Interface (API) allows BASIC programs or as-

sembly language routines to exchange data with screens. BASIC routines and calls are provided to help you deal with screen and keyboard data. This arrangement is better than having no API but not as good as APIs that can use C because compiled C programs tend to run faster than BASIC programs.—**Charles Teets**

AdaptSNA 3270 and AdaptModem

Depending on your point of view, Network Software Associates' *AdaptSNA 3270* for the AdaptModem is either more than a fully integrated SNA communications package or somewhat less.

NSA treats the *AdaptSNA 3270* software essentially as a standalone SNA synchronous communications program—in the same sense that *Crosstalk XVI* is a standalone asynchronous communications program. The software and the AdaptModem are sold separately—at $585 for the software and $1,195 for the board. The manual is organized as a soft-

The SNA market is much larger than the bisync one, and many of the products are good. INS Corp.'s *SDLC PC Adapter* is an excellent choice, primarily for its easily installed board and its extremely flexible and versatile keyboard configuration programs.

Pathway Design, which earned our praise in the bisync roundup ("Micro-to-Mainframe connections: Remote Possibilities," Volume 5 Number 15), again deserves it. The pcPath SNA-3270, like its bisync sibling, is exceptionally well organized and well documented. However, the concurrent-sessions capability, which caught our eye in the bisync package, is a regular feature of SNA remote emulation boards. pcPath SNA-3270 is therefore not as outstanding in its class.

Cleo PC2-3276/12 SNA
Cleo Software
Division of Phone 1
1639 N. Alpine Rd.
Rockford, IL 61107
(800) 233-CLEO
(815) 397-8110 (in Ill.)
List Price: $1,595, including SyncModem ($199 for advanced file-transfer software)
Requires: 256K RAM (384K RAM with file-transfer option), one disk drive, DOS 2.0 or later.
In Short: Cleo's high price includes an attractive extra: an auto-dial modem. Advanced file-transfer software for fast transfers is available but priced separately.

ware manual with a generic modem in mind. Details on the AdaptModem hardware show up in an appendix.

If you know what you're doing and you want to mix one vendor's software with another's hardware, you will probably consider this approach a plus. If you're new to PCs or synchronous communications, however, you might prefer a package that gives you more-tightly integrated instructions for getting started.

Less-experienced users are also likely to be stymied by the manual, which carries terseness to new extremes. All the technical information you need is there, but you won't find much in the way of explanations. The instructions for a floppy system tell you to copy the distribution disks to two formatted disks and then reboot the system. Of course, this will not work unless you have formatted one of the disks with the /S (or system) parameter, but the manual assumes you know that already.

The *AdaptSNA 3270* software is designed for the IBM SDLC Communica-

SimplifyComputing

tions Adapter, which makes it compatible with any equivalent board. According to NSA, the program works with at least 13 boards, including 3 sold by NSA.

The AdaptModem hardware, a combination emulator board and modem made by UDS, is the same board used by Intelligent Technologies International in its Modem Exchange package (see review). Its jumpers and DIP switches are preset to work in most systems. If you need to change the settings, the information is easy enough to find—as long as you know how to interpret the charts.

The configuration program, like the manual, is easy to follow if you know what you're doing, but it doesn't qualify as intuitive. Many users are trained to hit the Esc key when they want to back up one screen. In this program, doing that will dump you to DOS without saving your changes and without asking you first. An inexperienced user may be overwhelmed by the technical look of some of the screens. The ASCII-to-EBCDIC translation table, for example,

simply puts a chart of hex codes on-screen and assumes you are familiar with both the ASCII and EBCDIC codes.

Other choices in the configuration program include a user-definable EBCDIC-to-ASCII translation table, a printer configuration menu (more hex codes), a keyboard configuration menu, a logical unit assignment menu, and the main menu, which includes the settings the mainframe needs to see—cluster address, station ID, and device type.

ON THE LEAN SIDE For the most part, the package works as expected, but most features are on the lean side. For example, the board can auto-dial, and the software includes an auto-dial function. But there is no telephone book in the software. You either have to type the phone number at the keyboard or create a batch file with the number in it.

Similarly, the not-quite-hot key lets you leave the emulator without breaking the phone connection, but to get back to the mainframe session you have to reload the program. This approach has the advantage of freeing up more memory for DOS applications, but you lose the convenience of bouncing back and forth at will. (According to NSA, the next release of the software will retain this option and add a true "hot key.")

Other features include support for multiple sessions with a maximum of two displays and two printers. The program comes with both a predefined typewriter keyboard layout and a data entry keyboard layout.

PC Magazine Labs tests turned up one problem in the emulation. Version 652 of the *AdaptSNA 3270* software does not respect numeric fields. According to NSA, this bug was inadvertently introduced in a recent revision of the software, and it will be corrected the next time around.

Finally, note that the current version of *AdaptSNA 3270* has no file-transfer capability. According to NSA, however, the next release will include support for transfer with the standard IBM file transfer program running under TSO and CICS. Since file transfer is one of the main reasons for using a PC instead of a dumb terminal, you might want to bypass this package for now but plan to take another look at it when the new version comes out this fall.

—M. David Stone

Bill Harts is president of Open Communications, a Melville, New York–based communications consulting firm. Charles Teets is president of TCT Consulting, a New Jersey–based PC communications consulting firm. M. David Stone is a frequent contributor to PC Magazine.

■ PC LAB NOTES: FILE SECURITY ■ WINN L. ROSCH

KEEPING YOUR FILES PRIVATE

Passwords, hidden files, illegal filenames, and encryption schemes give your hard disk varying degrees of protection from the curious or crooked.

A personal computer with a hard disk, like a filing cabinet to which it is so often compared, holds some of your most valuable records. The filing cabinet has at least one advantage over the high-tech PC, however: it can be locked. The PC on your desk is almost an open invitation to prying eyes.

While you could, of course, lock your machine at night, physical security measures may entail an unacceptable degree of inconvenience (one exception: removable mass storage devices, such as the Bernoulli Box). The state-of-the-art alternative is electronic security: locking your files digitally so that unauthorized peepers cannot gain a glimpse of what is meant for your eyes only. Similarly, if you have programs that give you a valuable competitive edge, you can lock them in ways that make them impossible to copy.

This article will explore some of the rudimentary means you can use to protect the confidentiality of your PC and its data. While no electronic measures are theoretically fail-safe, even at this basic level, breaking in will require effort and a knowledge of the PC system. The security measures discussed here will thus at least discourage prying even if they cannot absolutely guarantee the security of your machine or files.

PREVENTING ACCESS WITH PASS-WORDS

Most personal computer security systems are based on the concept of access control: only one or a few designated individuals should know how to gain access to the system and its data. For access

control to work, of course, the system must first have the ability to recognize authorized users and be able to distinguish them from interlopers.

Passwords are probably the most common means of identification. The computer requests an identifying password from the operator and compares his or her response to the correct password it has in its memory. If the keyed-in password and the one in memory match, access is allowed to the system.

A password scheme is easy to implement by writing a short BASIC program. All it really requires is an INPUT statement and a string comparison. The example below illustrates how easily such a

scheme can be implemented:

```
10 PASSWORD$="SWORDFISH"
20 INPUT "What is the password";TEST$
30 IF TEST$=PASSWORD$ THEN PRINT "CORRECT!"
   ELSE BEEP:PRINT "ACCESS DENIED!"
```

The INPUT statement in this simple program puts the message "What is the password?" on the screen and waits for a typed response. It then compares the typed string to the programmed password (in this case, "SWORDFISH"). If the typed string does not match the password, the computer beeps, displays "ACCESS DENIED," and ends the program.

If the input string and the password match, then the program prints "CORRECT!" on the screen and, in this case, stops. However, when such a routine is used in an actual system, the next step would be to execute whatever program was supposed to execute.

Such a simple scheme can easily be improved upon. Note, for example, that the keystrokes typed in response to an INPUT statement (as in the above routine) are always echoed to the screen. Thus, anyone peeking over your shoulder could glimpse the password and return later to do his dirty work. By substituting a series of INKEY$ statements, however, the on-screen echoing is eliminated, as below:

```
10 TEST$=""
20 PASSWORD$="SWORDFISH"
30 PRINT "What is the password? ";
40   A$=INKEY$
50   IF A$="" THEN GOTO 40
60   IF A$=CHR$(13) THEN GOTO 90
70   TEST$=TEST$+A$
80   GOTO 40
90 PRINT
100 IF TEST$=PASSWORD$ THEN PRINT "CORRECT!"
    ELSE BEEP:PRINT "ACCESS DENIED!"
```

■ PC LAB NOTES

In this example, the response is typed into a loop of INKEY$ statements. IN-KEY$ causes the keyboard to be continuously read but not printed on the screen.

After each keystroke is read, it is compared to a null string (meaning no key has been struck), in which case it is ignored. Then it is compared to a carriage return (ASCII 13), which will be typed to end the password. When this is encountered, the loop is ended and the program continues to its next step. All other keystrokes are appended to the string TEST$.

After Return is pressed, the completed input string (TEST$) is compared to the programmed password (PASSWORD$), as in the first example.

These few lines of password protection can be added to the beginning of almost any BASIC program to guard against unauthorized usage. As a further precaution, you can include a program with password protection in the AUTOEXEC.BAT file of your system as a way to prevent unauthorized use of your PC.

LIMITING BREAKS The most obvious weakness of these password schemes is that the Ctrl-Break sequence can interrupt programs and batch file execution on the PC. For instance, the AUTOEXEC.BAT file containing the password program can easily be halted by pressing that key combination. The protection program itself can be broken into simply by pressing Ctrl-Break. Thus, to make any password scheme effective, some means of defeating the operation of the Ctrl-Break key combination is necessary.

One of the quickest ways to prevent Ctrl-Break break-in from the DOS prompt is to change the interrupt that the system executes when it detects a Ctrl-Break. That interrupt is 1B (hex).

NOBREAK.COM (see the short program shown in Figure 1) can be created with DEBUG. It is a 14-byte command that simply redirects the normal 1B interrupt to an ordinary "interrupt return" instruction. The Ctrl-Break sequence thus ends as soon as it begins, without breaking into the execution of batch files (or the directory listings, or anything that Ctrl-Break would ordinarily stop).

After you create the program, make it the first listing in the AUTOEXEC.BAT

```
C:debug nobreak.com
-a
XXXX:0100 MOV AX,251B
XXXX:0103 MOV DX,010D
XXXX:0106 INT 21
XXXX:0108 MOV CX,010E
XXXX:010B INT 27
XXXX:010D IRET
XXXX:010E
RCX
:0000
:010E
-w
-q
```

Figure 1: Typing in this quick assembly language program using DEBUG will make a program called NOBREAK.COM, which defeats the function of pressing Ctrl-Break at the DOS prompt. The XXXX value will vary for different machines.

file in your system.

Unfortunately, this strategy won't work with the BASIC password programs shown earlier, for BASIC resets the Ctrl-Break interrupt when it starts running. However, you can reroute the Ctrl-Break interrupt during BASIC, too, using the appropriate PEEKs and POKEs.

Figure 2 shows a program that reroutes the Ctrl-Break interrupt. In Figure 2, indeed, the interrupt is not merely eliminated: it is redirected so that it duplicates the function of interrupt 19h (decimal 100). Interrupt 19h resets the system by simulating the simultaneous pressing of the Ctrl-Alt-Del keys. (Because this tactic flagrantly sidesteps the design of the PC system, some computers may lock up when trying to reboot using this routine. That result, of course, serves your purpose just as well.)

HARDCORE HARDWARE SECURITY MEASURES Still a further problem with password access control systems is that they can usually be defeated by an interloper who inserts a boot disk in drive A:. Since the PC system tries to boot from a floppy disk before trying out the hard disk, even if you've protected your hard disk from prying eyes, an erstwhile spy need

```
10 DEF SEG=0
20 FOR X=0 TO 3
30      Y=PEEK(100+X)
40      POKE (108+X),Y
50 NEXT X
```

Figure 2: This BASIC program switches the Ctrl-Break interrupt so act as a warm reboot and so prevents Ctrl-Break from interrupting BASIC programs.

only boot it up using drive A: and a DOS disk.

Eliminating such subterfuge requires a hardware security scheme of some kind. The most effective commercial security systems add extra ROM memory to your system so that a password is required for access even before the booting processing begins. Making a security ROM is difficult and requires special equipment, however. *[Readers interested in this topic should see Charles Petzold's discussion in PC Tutor, PC Magazine, Volume 5 Number 1—Ed.]*

A simpler way to prevent break-in booting from floppy disk is to disable drive A:. In systems with only one floppy disk drive, this procedure is best accomplished by turning drive A: (from which the system can boot) into drive B: (from which it cannot).

The secret to solving drive assignments is the wide ribbon cable that connects the floppy disk drive to its controller card. In the IBM scheme of things, the floppy disk cables have three connectors: one for the controller card, and one for each of the two floppy disk drives that can be mounted in the system unit. The two floppy connectors differ visually from one another because IBM gives the wide ribbon cable a twist before it reaches the drive A: connector.

You should remove this connector at the drive A: end and replace it with the connector originally intended for a second floppy unit (drive B:). On a system originally set up for a single floppy drive, you must now also reset the DIP switch settings to indicate that two floppy disks are installed—even though you've left the old drive A: connector dangling. Your machine will now recognize the existing PC floppy drive as B:. (With the AT, you'll have to go through its setup procedure.)

ENCRYPTING FILES A floppy left unguarded for even a short while may be compromised; smaller information is as fast as DOS's COPY command. Data security can also be breached if you exchange disks with a coworker or if you transmit files through a telecommunications system. Electronic messages can be intercepted as easily as tapping a normal telephone line.

While no completely fail-safe method

■ Stealing information is as fast as DOS's COPY command. A good way to minimize the danger is to encrypt (encode) your files.

```
10 INPUT "What is the source file";SOURCE$
20 INPUT "What is the destination file";DESTINATION$
30 INPUT "What is the code key";CODEKEY$
40 Y=1
50 OPEN SOURCE$ AS #1 LEN=1:FIELD #1, 1 AS A$
60 OPEN DESTINATION$ AS #2 LEN=1: FIELD #2, 1 AS B$
70 FOR X= 1 TO LOF(1)
80    GET #1,X
90    CODE=A$
100   IF ASC(CODE$)-ASC(MID$(CODEKEY$,Y,1)) <0 THEN CIPHER=(256+ASC(CODE$))-
      ASC(MID$(CODEKEY$,Y,1)) ELSE CIPHER=ASC(CODE$)-ASC(MID$(CODEKEY$,Y,1))
120   Y=Y+1:IF Y>LEN(CODEKEY$) THEN Y=1
130   LET B$=CHR$(CIPHER)
140   PUT #2,X
140 NEXT
150 CLOSE
```

Figure 4: *This program is the complement to the one in Figure 3 and will decrypt a file when the proper code key is given.*

of preventing such security leaks is likely to be practical, a good way to minimize the danger from a file's falling into the wrong hands is to encrypt (encode) it. Although in theory no encoding system is absolutely secure—some government agencies specialize in breaking the most-complex codes, using the most-powerful computers—at the practical level you can make deciphering your messages so difficult that all but the most determined eavesdroppers will be deterred.

The most basic coding scheme is simple substitution, representing one character of the original document or digital byte of a program with a different character or byte. As you may know from having solved the cryptograms in newspapers, however, such simple substitution codes are also the easiest to break. The frequency of occurrence of the various characters (which provides valuable insight into breaking the code) does not change with the substitution.

Figure 3 improves on this elementary substitution code by mathematically com-

bining a code key with the ASCII character of each byte of an original file. Thus, in the resulting encrypted file, character frequencies are disrupted, and the code is much more difficult to break.

The program shown in Figure 3 is conceptually simple. First, it solicits the names of a source file, a destination file, and a code key. Then it merely reads one character at a time from the source file, adds the value of the next character in the code key to the source character value (adjusting it to keep it within a normal byte value), and then writes the result into the destination file. (Because it works one character at a time and runs under the BASIC interpreter, this program executes rather slowly.)

The code key can be a character, a word, or an entire sentence—anything that a BASIC input statement will accept. You can increase the possibilities for code keys by using a LINE INPUT statement instead.

Figure 4 shows the complementary decoding program. The only major difference between it and the previous program

is that it subtracts the value of the code key character from the appropriate byte in the source file.

The programs given in Figures 3 and 4 can form a basic encryption system. Files can be coded and recovered intact only by those knowing the appropriate code key. [*Readers seeking an even higher degree of encryption-based file security should consider Steven Holtzer's LOCK.COM, in our Programming/Utilities column, PC Magazine,Volume 4 Number 18—Ed.*]

PROTECTING PROGRAMS WITH COPY PROTECTION Since keeping your special programs your own is usually a matter of preventing interlopers from copying them from your hard disk files, one expedient would be to disembowel DOS and defeat its COPY command. A better solution, however, is to work on the periphery of DOS, taking advantage of some of its idiosyncrasies. DOS is very particular about filenames, for example. With but a few exceptions, DOS will not allow you to use nontext characters in filenames. However, you can use many higher-level languages—BASIC or even assembly language—to create filenames that DOS will refuse to deal with individually. Even DEBUG won't let you directly edit a file with an illegal name.

Using BASIC, however, you can give a file you wish to protect an illegal filename. Suppose you don't want anyone to see your file INCOME.TAX. If you load BASIC you can then give the direct command:

NAME INCOME.TAX IN OME.TAX

Since the filename contains an illegal character (a space), DOS won't let it be copied

Figure 3: *This short BASIC program will encrypt any file using a code key of your choice. Because it works one character at a time, however, it is somewhat slow.*

```
10 INPUT "What is the source file";SOURCE$
20 INPUT "What is the destination file";DESTINATION$
30 INPUT "What is the code key";CODEKEY$
40 Y=1
50 OPEN SOURCE$ AS #1 LEN=1:FIELD #1, 1 AS A$
60 OPEN DESTINATION$ AS #2 LEN=1: FIELD #2, 1 AS B$
70 FOR X= 1 TO LOF(1)
80    GET #1,X
90    CODE$=A$
100   CIPHER=ASC(CODE$)+ASC(MID$(CODEKEY$,Y,1))
110   IF CIPHER>255 THEN CIPHER=CIPHER-256
120   Y=Y+1:IF Y>LEN(CODEKEY$) THEN Y=1
130   LET B$=CHR$(CIPHER)
140   PUT #2,X
150 NEXT
160 CLOSE
```

■ PC LAB NOTES

FACT FILE

SOFTWARE

Coffee Break
MPPI Ltd.
2200 Lehigh Rd.
Glenview, IL 60025
(312) 998-8401
List Price: $24.95
Requires: 8K RAM, DOS 1.0 or later.
In Short: A keyboard lock that lets the machine execute a program while the screen is blank and the keyboard is frozen. Not copy protected.
CIRCLE 659 ON READER SERVICE CARD

Corporate Courier
Obsidian Computer Systems
580 Grand Ave., Suite N
Oakland, CA 94610
(415) 839-0101
List Price: $125
Requires: 256K RAM, DOS 1.1 or later.
In Short: For corporate networks. Uses the public key model to encrypt text or binary files. Allows telecommunications transmission. Copy protected.
CIRCLE 660 ON READER SERVICE CARD

Data Encoder
IBM
1133 Westchester Ave.
White Plains, NY 10604
(914) 765-7000
List Price: $109
Requires: 192K RAM, DOS 2.0 or later.
In Short: Menu-driven utility that uses the DES algorithm to encode/decode text or binary files. Not copy protected.
CIRCLE 667 ON READER SERVICE CARD

DATALOK
Vault Corp.
2649 Townsgate Rd., #500
Westlake Village, CA 91361
(800) 445-0193
(805) 499-5978
List Price: $169
Requires: 128K RAM, hard disk drive.
In Short: Protects data files from unauthorized access and duplication using DES- or Vault-based proprietary encryption. Encrypts files based upon the presence of a physical fingerprint that is placed on included disks. Network compatible; decrypts files, can transfer secured data by modem; optional password access. Copy protected.
CIRCLE 666 ON READER SERVICE CARD

Data Padlock
Glenco Engineering
3920 Ridge Ave.
Arlington Heights, IL 60004
(312) 392-2492
List Price: $65
Requires: 64K RAM, DOS 2.0 or later.
In Short: Encodes text or binary files with a software implementation of the DES algorithm. Not copy protected.
CIRCLE 665 ON READER SERVICE CARD

DataSafe
Trigram Systems
3 Bayard Rd., #66
Pittsburgh, PA 15213
(412) 682-2192
List Price: $139
Requires: 64K RAM, DOS 2.0 or later.
In Short: DataSafe encrypts text or binary files using the DES algorithm. Not copy protected.
CIRCLE 664 ON READER SERVICE CARD

Failsafe Encryption
Jackson Software
1729 Mayflower Dr.
Carrollton, TX 75007
(214) 492-1982
List Price: $59.95
Requires: 64K RAM, IBM PC, XT, AT, or most compatibles; DOS 2.0 or later.
In Short: An encryption software package with added safety factors to prevent unwanted disk destruction. Prevents accidental double encryption and decryption. Will not encrypt .EXE, .BAC, or .COM files unless specifically instructed. Not copy protected.
CIRCLE 663 ON READER SERVICE CARD

FILELOK
Vault Corp.
2649 Townsgate Rd., #500
Westlake Village, CA 91361
(800) 445-0193
(805) 499-5978
List Price: For package of two, $18.50
Requires: 128K RAM.
In Short: Protects data files from unauthorized access and duplication using DES- or Vault-based proprietary encryption. Encrypts files based upon the presence of a physical fingerprint that is placed on the disk itself. Files to be encrypted must be placed on fingerprinted disks. Copy protected.
CIRCLE 662 ON READER SERVICE CARD

HFTools for File/Directory Security, Version 1.04
H-F Computing Services Inc.
224 Old Orchard Grove
Toronto, Ontario
Canada M5M 2E3
(416) 485-5403
List Price: $350
Requires: 96K RAM, DOS 2.0 or later.
In Short: Integrated security software. Utilizes a proprietary algorithm to encrypt text or binary files. Not copy protected.
CIRCLE 661 ON READER SERVICE CARD

In-Use
Aurotech Inc.
925 So. Niagara St., #100
Denver, CO 80224
(303) 388-1612
List Price: $29.95
Requires: 64K RAM, DOS 1.0 or later.
In Short: A software keyboard lock that disables the keyboard while allowing applications to execute. Prevents unauthorized machine access during boot. Not copy protected.
CIRCLE 670 ON READER SERVICE CARD

MagLock
Flinder Software Laboratories
169 Burnside
Tonawanda, NY 14150
(716) 693-0584
List Price: $89
Requires: 64K RAM, hard disk drive or expansion chassis.
In Short: Secures any type of files, directories, or a 10-Mbyte drive in seconds without hardware or operating system modifications; encrypts data at the file level using DES or proprietary source module; creates read/write access or read-only access; includes utilities to clean up deleted files to ensure absolute deletion; audits files with a command; allows unlimited password selection. Not copy protected.
CIRCLE 668 ON READER SERVICE CARD

Mailsafe
RSA Data Security Inc.
10 Twin Dolphin Dr.
Redwood City, CA 94065
(415) 595-8782
List Price: $250
Requires: 192K RAM, DOS 2.0 or later.
In Short: An integrated package that provides nonforgeable signatures and telecommunications encrypting as well as local encryption (either DES or a proprietary algorithm). Not copy protected.
CIRCLE 669 ON READER SERVICE CARD

PC-DESK
Software Studios Inc.
8516 Sugarbush Ct. #104
Annandale, VA 22003
(703) 978-2339
List Price: $125
Requires: Memory depends on functions loaded.
In Short: Integrated software package with proprietary encryption algorithm that provides on-screen encryption and telecommunications capabilities. Not copy protected.
CIRCLE 657 ON READER SERVICE CARD

Personal Courier
Obsidian Computer Systems
580 Grand Ave., Suite N
Oakland, CA 94610
(415) 839-0101
List Price: $75
Requires: 256K RAM, DOS 1.1 or later.
In Short: For networked PCs. Uses the public key model to encrypt text or binary files. Not copy protected.
CIRCLE 655 ON READER SERVICE CARD

PhasorCode 1000
International Phasor Telecom Ltd.
134 Abbott St.
Vancouver, British Columbia
Canada V6B 2K6
(604) 732-1422
List Price: $99
Requires: 256K RAM, DOS 2.0 or later.
In Short: Uses public key model to encrypt text or binary files. Translates ASCII files to and from binary files. Not copy protected.
CIRCLE 656 ON READER SERVICE CARD

PrivacyPlus
United Software Security Inc.
8133 Leesburg Pike, #800
Vienna, VA 22180
(800) 892-0007
List Price: $195
Requires: 64K RAM, DOS 2.0 or later.
In Short: Provides menu-driven, memory-resident encryption, utilizing either the DES standard algorithm or a faster, proprietary algorithm. Not copy protected.
CIRCLE 654 ON READER SERVICE CARD

The Private Line
Everett Enterprises
P.O. Box 193
Bath, NC 27808
(919) 923-5621
List Price: $49.95
Requires: DOS 2.0 or later.
In Short: Encrypts text, data, and programs using DES; converts encrypted data to ASCII; displays, prints, and purges files. Not copy protected.
CIRCLE 653 ON READER SERVICE CARD

PROTEC, Version 3.1
SOPHCO, Inc.
P.O. Box 7430
Boulder, CO 80306-7430
(303) 444-1542
List Price: $128K RAM, hard disk drive, DOS 2.0 or later.
In Short: Integrated security package. Encrypts text or binary files using either DES or a faster, proprietary algorithm, the PhFA II. Not copy protected.
CIRCLE 652 ON READER SERVICE CARD

SecretDisk
Lattice Inc.
P.O. Box 3072
Glen Ellyn, IL 60138
(312) 858-7950
List Price: $119.95
Requires: 128K RAM.
In Short: Protects data from unauthorized access by use of a password. Creates virtual disk drives that are automatically and completely encrypted. Not copy protected.
CIRCLE 651 ON READER SERVICE CARD

Secrets
Balis Computing Inc.
1121 S.W. 19th St.
Boca Raton, FL 33432
(305) 391-4610
List Price: $52
Requires: 128K RAM, DOS 1.1 or later.
In Short: Encrypts ASCII or word processing files using one of two thousand proprietary codes. Permits dual encryption and modem transmission. Not copy protected.
CIRCLE 650 ON READER SERVICE CARD

SECURE! PS
Winterhalter Inc.
P.O. Box 2180, Dept. P.S.
Ann Arbor, MI 48104
(313) 662-2002
List Price: $69.95; with audit trail (mid-August release), $99.95
Requires: 64K RAM, DOS 2.0 or later.
In Short: Automatically encrypts data, files, directories, or entire disks; has keyboard lock and screen-clearing features; allows up to 110 users on a PC or disk drive; soon-to-be-released audit trail generates reports on computer usage. Not copy protected.
CIRCLE 649 ON READER SERVICE CARD

Super Encrypter I & II
Obsidian Computer Systems
580 Grand Ave., Suite N
Oakland, CA 94610
(415) 839-0101
List Price: Super Encrypter II,
$99.95; Super Encrypter I $49.95.
Requires: 256K RAM, DOS 1.1 or later.
In Short: Utilizes a proprietary encryption algorithm to encrypt text or binary files; allows encrypted data to be sent over modems. Super Encrypter II uses proprietary code; Super Encrypter I not copy protected.
CIRCLE 648 ON READER SERVICE CARD

SuperKey
Borland International Inc.
4113 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400
List Price: $69.95
Requires: 128K RAM, DOS 2.0 or later.
In Short: Integrated keyboard macro memory-resident program that encrypts using either DES or Borland's proprietary algorithm. Not copy protected.
CIRCLE 647 ON READER SERVICE CARD

U-PSYPHER
Prime Factors Inc.
6529 Telegraph Ave.
Oakland, CA 94609
(415) 654-8090
(415) 654-8040
List Price: $295
Requires: 64K RAM.
In Short: Encryption and decryption package using a variety of modes of the DES. Includes data encryption file by file, protection of data stored on disk or hard disk, and file authentication to indicate whether a file has been altered. Not copy protected.
CIRCLE 646 ON READER SERVICE CARD

Vfeature
Golden Bow Systems
2870 Fifth Ave., #201
San Diego, CA 92103
(619) 298-9349
List Price: For standard, $80; for deluxe, $120; shipping, $3
Requires: 64K RAM, hard disk drive.
In Short: Partitions hard disks into multiple logical drives that can be password protected. Can write-protect and prevent downloading to a floppy drive. Deluxe version can partition logical drives up to 390 Mbytes. Copy protected.
CIRCLE 645 ON READER SERVICE CARD

Watchdog, Version 4.1
Fischer Innis Systems Corp.
4175 Merchantile Ave.
Naples, FL 33942
(800) 237-4510
(813) 793-1760
List Price: $295
Requires: 256K RAM, hard disk drive.
In Short: Integrated security package. Uses proprietary algorithm. Leaves encryption transparent to valid end user. Not copy protected.
CIRCLE 644 ON READER SERVICE CARD

■ PC LAB NOTES

FEDERAL AND COMMERCIAL SECURITY SCHEMES
The National Bureau of Standards' DES algorithm provides the most security. But proprietary algorithms work faster when complete security isn't required.

For most users concerned about data security, the solution lies among the commercially available security products that encrypt your files.

The lock-and-key method serves as the standard model for the vast majority of encryption algorithms used by these products. For a given password (or hardware key for hardware products), the algorithm generates a data-scrambling pattern based upon that password (or hardware key). Thus, a user's password serves as the unique key that decrypts the coded information.

The public key system improves upon the lock-and-key method by allowing the use of two passwords: a public key and a private key. The public key generates the code that encrypts the data and can be

or typed. To use the file again, you simply go into BASIC and NAME it with a legal filename that DOS can handle. The only problem, of course, is that if you know this trick of using BASIC, a potential file snatcher may know it as well. To help ensure that no one knows that your file (with or without an illegal name) is on your disk, you must use DOS to hide it.

HIDING FILES AND DIRECTORIES
Both files and even entire subdirectories can be marked as "hidden." A hidden file is one that simply doesn't appear if you take a DIR listing of the files on a disk. While DOS itself provides no direct means of making subdirectories invisible, DEBUG will ably handle the task. Commercial byte-level editors make the chore even easier.

Hiding files with DEBUG takes a little work and can be dangerous because a misdirected command can wipe out a hard disk. Practice with an expendable disk before attempting this procedure on a hard

safely distributed. However, only the private key can decode the data.

The National Bureau of Standards' Data Encryption Standard (DES) algorithm, required by the government for sensitive financial transmissions, provides adequate security for anyone outside the Pentagon. The price for this heavy shroud of security is paid in speed; most DES implementations try the patience of users accustomed to run-times of a few seconds. For this reason, the majority of these programs can implement either the DES standard algorithm or their own proprietary algorithm. The proprietary algorithm sacrifices security for an increase in speed, giving quick-and-dirty encryption for those who need it.—**David Gray**

■ Using BASIC, you can give a file you wish to protect an illegal filename

disk or floppy containing important data.

To hide a floppy disk subdirectory with DEBUG, first run DEBUG (which is included on your DOS Supplemental Files distribution disk). Next, assuming you want to work with the floppy disk in drive A:, type

```
L CS:0100 0 5 1 <Enter>
```

This loads (L) into the current segment (CS) at memory location 0100, one sector starting at sector 5 of disk 0 (which is what DEBUG calls drive A:).

FACT FILE

HARDWARE

Data Sentinel
Rainbow Technologies Inc.
17971 Skypark Circle, Suite E
Irvine, CA 92714
(714) 261-0228
List Price: $200
Requires: DOS 1.1 or later.
In Short: Combines memo-driven software and hardware keys to implement either DES or a proprietary algorithm. Encrypts either text or binary files.
CIRCLE 643 ON READER SERVICE CARD

FIXT/S Security Chip
Golden Bow Systems
2870 Fifth Ave., #201
San Diego, CA 92103
(619) 298-9349
List Price: $95; shipping, $3
Requires: IBM PC-XT or compatible, hard disk drive.
In Short: Controls system and data access by preventing system boot and disabling booting from floppy drives. Accesses files by password only.
CIRCLE 642 ON READER SERVICE CARD

PC Lock I and IV
MPPI Ltd.
2200 Lehigh Ave.
Glenview, IL 60025
(312) 998-8401
List Price: PC Lock I, $179; PC Lock IV, $299
Requires: One short-card slot, all versions of PC-DOS.
In Short: PC Lock I allows up to 16 users to log on to total system access by ID and password; built-in Drive Lock prevents magnetic copy from C: drive to A: drive or B: drive; hard disk formatting protection. PC Lock IV controls access by read/write or read-only; controls access to root-level subdirectories; full audit trail and report generator.
CIRCLE 641 ON READER SERVICE CARD

Scrambler
Industrial Resource Engineering Inc.
10 Gerard Ave., #209
Timonium, MD 21093
(301) 561-3155
List Price: PC board version, $495; synchronous or asynchronous standalone device for speeds up to 1,200 bps, $559; synchronous or asynchronous standalone device for speeds up to 19,200 bps, $759.
Requires: One slot or external modem for PC board version.
In Short: Prevents unauthorized access to confidential files as data is transmitted over public phone lines using DES. Also encrypts files on disks.
CIRCLE 639 ON READER SERVICE CARD

Secure PS
Winterhalter Inc.
3853 Research Park Dr.
Ann Arbor, MI 48104
(800) 321-7785
(313) 662-2002
List Price: $325; with Audit Trail, $349; with MasterKey and Audit-Trail, $475.
Requires: One slot.
In Short: Provides board-level DES encryption that is 25 percent faster than the software *SECURE!* PS (100K file in 13 seconds). MasterKey allows authorized personnel access to all files.
CIRCLE 638 ON READER SERVICE CARD

**SHERLOCK FIMAC
Personal Computer Security Module**
Analytic Communications Systems
1820 Michael Faraday Dr.
Reston, VA 22090
(703) 471-0892
List Price: $1,125
Requires: One DTE line.
In Short: This hardware device provides DES standard encryption for data transmission that is fully compliant with the Financial Institution Message Authentication Standard. Available as either an in-circuit or peripheral attachment.
CIRCLE 636 ON READER SERVICE CARD

HARDWARE/SOFTWARE

Lock-It 1 and Lock-It 2
Security Microsystems Consultants
16 Flagg Pl., #102 PC
Staten Island, NY 10304
(212) 667-1019
List Price: Lock-It 1, $129.95; *Lock-It 2*, $79.95
Requires: IBM PC, XT, AT, or compatible (user must specify model), hard disk drive.
In Short: Lock-It 1 is a circuit board that fits on the motherboard without taking up a slot. Prevents boot-up until user-chosen password is entered. Includes software for optional hard-disk-only boot and a free optional timed clock. PC and XT versions come with Quickcom, a fast boot and true reset. *Lock-It 2* is a software product for the PC, XT, AT, or compatible, which creates password-accessible subdirectories on a hard disk. Not copy protected.
CIRCLE 637 ON READER SERVICE CARD

Voyager Software Protection
Voyager Development Inc.
412 S. Lyon St.
Santa Ana, CA 92701
(714) 667-8128
List Price: $300
Requires: One slot.
In Short: Combining software and hardware, this device uses a proprietary algorithm to encrypt text and binary files.
CIRCLE 635 ON READER SERVICE CARD

X-Lock 100
A Electronics Inc.
2137 Flinstone Dr.
Tucker, GA 30084
(404) 491-8044
List Price: $495
Requires: Hard disk drive, one short slot.
In Short: Half-card unit plus software. *XFILES* provides encryption, access control, and locking of files; *XWARE* provides management control by controlling access to printers, hard disks, and so on.
CIRCLE 634 ON READER SERVICE CARD

If you now type D and press Return, DEBUG will display the root directory of the floppy disk. On the left side of the screen are the hexadecimal byte values of the directory entries; on the right are the ASCII equivalents of these byte values.

Each directory entry requires two 16-byte records. The 12th character on the first line of a directory entry is the attribute byte of its directory entry. The following are the most common file attribute byte codes:

```
00 or 20   Ordinary file
01 or 21   Read-only file
02 or 22   Hidden file
03 or 23   Read-only and hidden file
08         Volume label
10         ordinary subdirectory
12         hidden subdirectory
```

To hide a subdirectory, then, you need only change its attribute from 10 to 12. To do this, determine the location of the attribute byte by adding a hexadecimal B (11 in decimal) to the right four-digit number in the leftmost column displayed by DE-

■ PC LAB NOTES

■ While DOS provides no
direct means of making
subdirectories invisible,
DEBUG can ably handle
the task. Commercial
byte-level editors make
the chore even easier.

BUG. If DEBUG shows 23E1:01C0 in the
leftmost column of the row containing the
subdirectory you want to hide, then the lo-
cation of the attribute byte will be 01CA.

To change the attribute, type the fol-
lowing, substituting your own attribute lo-
cation for 01CA:

E 01CB

DEBUG will respond with the display

E 01CB:10

Just type 12 and press Return to change the
subdirectory attribute to hidden.

As the final step, you write the new at-
tribute back to disk with this command

W CS:0100 0 5 1 <Enter>

Now exit from DEBUG by typing Q and
pressing Return. You can use this same
method to hide a file. Just add 2 to the file's
nonhidden attribute to make it hidden. *[If
using DEBUG to change a file's attribute
to hidden seems a cumbersome or dicey
way to proceed, you can use Charles Pet-
zold's* ATTR.COM, *which appeared in
the Programming/Utilities column in PC
Magazine,* Volume 5 Number 11.—Ed.]

Your hidden directory will be invisible
to DOS's DIR command, but pathnames
containing it will remain valid. In addition
you can change directory (CD) and other-
wise use the hidden directory like any oth-
er. However, if interlopers don't know the
name of the hidden directory, they won't
even know that there are files stored in it,
and thieves don't try to steal what they
can't see.

■ **PROGRAMMING/UTILITIES** ■ RONALD CZAPALA

WEED OUT EXCESS FILES WITH XDEL

If too many files have sprouted up in your directories, here's the easy way to clear out the unwanted overgrowth.

Although DOS stands for Disk Operating System, its limited versatility can make disk management more operation than system. As a result, disk management utilities and DOS shells are popular among users who want to isolate themselves from cumbersome commands and repetitive procedures. The trouble with such overall approaches, however, is that while they may simplify one task, they may limit the user's other options even more than does DOS.

XDEL thus addresses only one specific aspect of disk management: the need to scan quickly through a directory and delete extraneous files. This task is normally accomplished by repeatedly issuing the DIR command and diligently entering DEL for each file that needs to go. After deleting a few files, the directory listing scrolls off the screen and you have to repeat the procedure. Using wildcard names in DEL commands often helps, of course, but can often require reaching quickly for *The Norton Utilities* to recover files you inadvertently zapped.

No more. XDEL.COM lets you zip through your directories one file at a time, deleting superfluous files with a keystroke. It accepts a drive/filename specification to point to the correct disk and to select a specific group of files to examine. The syntax for invoking XDEL is

    XDEL [d:][file.ext]

where *d:* is the drive specifier and *file.ext* is a filename that defaults to *.*. If none is entered. Wildcard entries are acceptable, but path specifications are not. Use DOS's CD

(CHDIR) command to make the target directory the current directory prior to using XDEL.

RUNNING XDEL When entered, XDEL clears the screen and displays the chosen drive, the current target directory, and the file-matching specification from which it will select files. Instructions for deleting the program are displayed, and the first file is listed. To delete the last file shown, simply press the F1 key. The filename will be flagged with a left pointer symbol (17h) if it has been successfully deleted, and the next filename will appear. Any read-only files in the directory will be listed but cannot be deleted: you'll get an audible beep if you try. To skip to the next filename, press the PgDn key. Should you skip over a file that you had intended to delete, pressing the Home key will restart the scan from the top. Hitting Esc allows you to exit at any time.

■ **XDEL.COM lets you zip through your directories one file at a time, deleting superfluous files with a keystroke. Wildcard entries are OK.**

Five filenames will fit on each line. When the screen becomes full, XDEL leaves the instruction area intact, scrolls the file area up halfway, and continues on. There are two error messages: if no matching files are encountered, a "File not found message" is issued; and if you enter a path specification or try to address a drive outside the range from A: through Z:, XDEL tells you of your mistake and exits.

The assembly language source code for XDEL is shown in Figure 1. Readers who do not have a modem (see sidebar "Downloading XDEL") and who wish to create XDEL.COM by typing in and running a BASIC program should use the listing in Figure 2.

XDEL'S INNER WORKINGS XDEL requires DOS 2.0 or later because the heart of the program depends on the extended file management functions provided by the DOS Function Call INT 21h. To accomplish their assigned tasks, these functions utilize ASCIIZ character strings to specify drive, path, and filename information to the operating system. A traditional file management function, Function Call 029h, is available to parse the command line into an FCB (file control block), but this function will not handle path entries and is not particularly handy when using the extended functions. Unfortunately, DOS did not provide a similar routine within the extended file management functions when it introduced tree-structured directories. Therefore, program developers must derive the necessary information from the unformatted command line. This

information is contained in the PSP (program segment prefix) parameter area that DOS builds in front of each program before relinquishing control to it.

XDEL starts out by capturing certain information it will use in its screen-handling routines. This is accomplished by means of the BIOS Video Interrupt, 10h. Loading 08h into the AH register before calling this interrupt causes it to return the value and corresponding screen attribute of the character at the current cursor position, along with the active video page. XDEL saves the screen attribute (unless it is predefined in the ATTR field) and the active page value for later use.

The unformatted area of the PSP is then parsed into the drive and file specification fields. The PARM_SCAN routine gets the next byte from the parameter area and compares it against a string of delimiter characters. If the zero flag is set upon return from the routine, the character returned in the AL register is a delimiter. This makes it easy to bypass these characters or to control processing by their presence or absence. If the drive is not specified, the default drive is determined with DOS Function Call 19h, whose code number is transformed into an alphabetic designator. If no file specification is entered, the default wildcard *.* filename is used.

Once the appropriate disk drive is determined, DOS Function Call 47h is used to retrieve the current directory, which is returned as an ASCIIZ string. This informa-

■ Five filenames will fit on each line. When the screen becomes full, XDEL scrolls up halfway and continues on.

tion, together with the drive and file specifications, will be used to request directory information from DOS. The directory path may be up to 64 bytes long, should the current directory be several layers down in the tree structure. After clearing the screen (by

DOWNLOADING XDEL

The programs that appear in our Programming/Utilities column (as well as other programs we publish) can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. Making copies for others (including placement on other electronic

bulletin boards), with or without charge, is a violation of the Ziff-Davis copyright.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1200 (or 300) bps, 8 data bits, 1 stop bit, no parity. PC-IRS files with a .COM, .EXE, or .ARC extension require the Xmodem error-checking protocol; our other files (e.g., with extensions of .ASM or .BAS) can be downloaded using either regular ASCII or Xmodem transmission.

XDEL.BAS, whether typed in from the magazine and your keyboard or downloaded from PC-IRS, will automatically create XDEL.COM when run once in BASIC. XDEL.ASM, listed here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft) and the following commands:

```
MASM XDEL;
LINK XDEL;
EXE2BIN XDEL XDEL.COM
```

—Craig L. Stark

XDEL.COM AT A GLANCE

Syntax:

XDEL [d:][file.ext]

Operations:

<F1>	Deletes current file displayed
<PgDn>	Skips current file displayed
<Home>	Restarts file display
<Esc>	Returns to DOS

using another BIOS video function call) and displaying the heading, target directory path, file specification, and instructions, the program starts searching for files that match the request.

SEARCHING THE DIRECTORY DOS provides two handy functions for accessing directory information through the Interrupt 21h Function Calls 4Eh and 4Fh. Function Call 4Eh requires a filename parameter in the form of an ASCIIZ string and a file attribute code. The file attribute may have various values that indicate whether a file is a read-only, a hidden, or a system file, a volume label, a subdirectory, or an archived file. Function Call 4Eh returns the first file in the directory that meets the requirement, while 4Fh will find all subsequent files that match. DOS writes information about each file it finds into the current Disk Transfer Area. This information includes the name, date, time, size, and attribute of the file. (On entry to

any program, DOS sets the Disk Transfer Area to occupy the same space as the unformatted parameter area of the PSP.) Function Calls 4Eh and 4Fh will return with the carry flag set if no more files match the selection criteria.

MAKING YOUR CHOICE After each filename is displayed on the screen, the program waits for a keystroke to indicate what action to take next. The GET_KEY routine uses another BIOS interrupt (16h), which retrieves a keystroke from the keyboard buffer or (if the buffer is empty) waits until one is entered. Certain key combinations generate so-called extended key codes, which are handled differently from "normal" keys. These special key values are marked by a zero (instead of the character value) in the AL register after the interrupt routine. The extended value appears in the AH register and is used to determine which key(s) were depressed. GET_KEY accepts all extended key codes

■ PROGRAMMING/UTILITIES

```
TITLE    XDEL.ASM    SCANS CURRENT DIRECTORY ALLOWING FILE DELETION.
                     COMMAND LINE SPECIFIES FILE MATCHING MASK

DOS      EQU     21H                     ;DOS FUNC INTERRUPT
VIDEO    EQU     10H                     ;BIOS VIDEO INTERRUPT

CSEG     SEGMENT
         ASSUME  CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG

         ORG     80H
PARM     LABEL   BYTE                    ;UNFORMATTED AREA OF PSP

         ORG     9EH
FNAME    LABEL   BYTE                    ;FILE NAME RETURNED IN DTA
                                         ; WITHIN PSP BY 4EH CALL
         ORG     100H
ENTRY:   JMP     BEGIN                   ;SKIP OVER DATA

APAGE    DB      "Copyright 1986 Ziff-Davis Publishing Co.",1,8
         DB      0                       ;CURRENT VIDEO PAGE
ATTR     DB      'ATTR'                  ;PATCH POINT TO PRESET
         DB      0                       ; SCREEN ATTRIBUTE
COUNT    DB      0                       ;COUNT FILE NAMES
DELIM    DB      $',',+\                 ;COMMAND LINE DELIMITERS

DRIVE_NO DB      ?                       ;DISK DRIVE (0=A, ETC)

DRIVE_SPEC  DB   3 DUP(0)                ;DRIVE LETTER + ":"
PATH_SPEC   DB   '\',6EH, 0UP(0),0       ;CURRENT DIRECTORY
DELETE_PATH DB   14 DUP(0),0             ; FILE NAME MASK
MATCH_PATH  DB   'A:*.*',9 DUP(0),0      ;NAME OR FILE TO DELETE
                                         ;MATCH STRING
INSTR       DB   13,10,10,'Home - first file match ',9,9,9
            DB   'PgDn - next file match ',13,10
            DB   'Fl - delete last file shown',9,9,9
            DB   'ESC - back to DOS',13,10
            DB   0 DUP(285),13,10

NDR      DB      9,9,9,'  DIRECTORY PURGE UTILITY',13,10
PATH_MSG DB      'Current Directory ',13,10,0
         DB      16,' ',0                ;RIGHT ARROW
NOT_FOUND DB     13,10,'File not found',0
BAD_SPEC  DB     13,10,'Invalid drive / file specification',13,10
          DB     'Change directory before using XDEL',0

SPEC_ERROR:
         MOV     DX,OFFSET BAD_SPEC      ;ERROR MSG
         CALL    PRT_ASCIIZ             ;PRINT ERROR
         INT     20H                     ;RETURN TO DOS

BEGIN:   MOV     AH,3                    ;GET CHAR/ATTR AT CURSOR POS
         INT     VIDEO                   ;BIOS CALL
         MOV     APAGE,BH                ;SAVE = ACTIVE PAGE
         CMP     ATTR,0                  ;ATTRIBUTE PRESET?
         JNE     SCAN_CMD                ;YES, USE SPECIFIED ATTR
         MOV     ATTR,AH                 ;NO, SAVE CURRENT ATTR

;SEARCH UNFORMATTED AREA OF PSP FOR FILE NAME SPECIFICATION
;TO USE IN FILE MATCH COMPARISON

SCAN_CMD:
         CLD                             ;SET DIRECTION FLAG
         MOV     SI,1 + OFFSET PARM      ;UNFORMATTED PSP AREA
         MOV     DI,OFFSET DRIVE_SPEC    ;DRIVE SPEC AREA

SKIP_DELIM:
         CALL    PARM_SCAN               ;GET NEXT PARM BYTE
         JE      GET_DRIVE               ;SKIP OVER LEADING DELIMS
         DEC     SI                      ;POINT TO 1ST BYTE OF SPEC
         CMP     AL,13                   ;CARRIAGE RETURN?
         JS      GET_DRIVE               ;YES, NO PARM SPECIFIED

         CMP     BYTE PTR [SI + 1],':'   ;DRIVE SPEC PRESENT?
         JNE     GET_DEFAULT             ;NO, GET DEFAULT DRIVE

         LODSW                           ;GET DRIVE AND ":"
         AND     AL,0DFH                 ;CAPITALIZE DRIVE LETTER
         JMP     STORE_SPEC              ;SKIP DEFAULT DRIVE CHECK

GET_DRIVE:
         MOV     AH,019H                 ;GET CURRENT DRIVE (0=A,ETC)
         INT     DOS                     ; THRU DOS CALL
```

Figure 1: The assembly language listing for XDEL.COM.

(Figure 1 continues)

■ PROGRAMMING/UTILITIES

```
            ADD     AL,'A'                  ;CHANGE TO LETTER
            MOV     AB,':'                  ;DRIVE SPEC SEPARATOR
STORE_DRIVE:
            CMP     AL,'A'                  ;VALID RANGE OF DRIVES
            JB      SPEC_ERROR
            CMP     AL,'Z'
            JA      SPEC_ERROR              ; INVALID DRIVE
            STOSW                           ;SAVE DRIVE SPEC AND ":"
            MOV     DI,OFFSET DELETE_PATH   ;DELETE RTN PATH
            STOSB                           ;LOAD DRIVE
            MOV     DI,OFFSET MATCH_PATH    ;FILE MATCHING PATH
            STOSW                           ;LOAD DRIVE
            SUB     AL,AL                   ;CNG DRIVE TO NUM (0=A, ETC)
            MOV     DRIVE_NO,AL             ;SAVE DRIVE
            CMP     BYTE PTR [BI],13        ;CARRIAGE RETURN ?
            JE      GLOBAL_SCAN             ;YES, SCAN *.*
            MOV     CX,12                   ;MAX LENGTH FILE SPEC
PARSE:
            CALL    PARN_SCAN               ;GET NEXT PARN BYTE
            JZ      PARSE                   ;SKIP DELIMS
            CMP     AL,13                   ;CARRIAGE RETURN
            JE      GLOBAL_SCAN             ;YES, END OF FILE SPEC
            CMP     AL,'\'                  ;PATH SPECIFIED?
            JE      SPEC_ERROR              ;YES, ERROR
            STOSB                           ;MOVE BYTE TO MATCH PATH
            DEC     CX                      ;COUNT FILE SPEC LENGTH
            JCXZ    END_SPEC                ;IF CX = 0, STOP BUILD
            JMP     PARSE
END_SPEC:
            MOV     BYTE PTR [DI],0         ;TRAILING ZERO
GLOBAL_SCAN:
            CALL    GET_PATH                ;GET PATH FOR DRIVE SPEC
RESTART:
            MOV     CLR_SCR                 ;CLEAR SCREEN
            MOV     DX,OFFSET SDR           ;SCREEN TITLE LINE
            CALL    PRT_ASCIIZ              ;SKIP DELIMS
            MOV     DX,OFFSET PATH_MSG      ;DIRECTORY INFO MSG
            CALL    PRT_ASCIIZ              ; AND PRINT
            MOV     DX,OFFSET DRIVE_SPEC    ;DRIVE/DATA/FILS
            CALL    PRT_ASCIIZ              ; AND PRINT
            MOV     DX,OFFSET PATH_SPEC     ;PATH_SPEC
            CALL    PRT_ASCIIZ              ;PATH SPEC
            MOV     DX,OFFSET MATCH_PATH + 2 ;FILE SPEC
            CALL    PRT_ASCIIZ              ; AND PRINT
            MOV     DX,OFFSET INSTR         ;INSTRUCTION LINE
            CALL    PRT_ASCIIZ              ; AND PRINT
            MOV     COUNT,0                 ;INITIALIZE FILE COUNTER
            MOV     DX,OFFSET MATCH_PATH    ;ADDRESS OF SEARCH MATCH
            MOV     CX,0                    ;ATTRIBUTE FOR FILES
            MOV     AH,84DH                 ;FIND FIRST NEXT
            INT     DOS                     ;THRU DOS FUNC CALL
            JC      ERROR_RTN               ;CARRY SET = ERROR
FILE_LOOP:
            MOV     DX,OFFSET FNAME         ;POINT TO FILE NAME
            CALL    PRT_ASCIIZ              ; AND PRINT
            ADD     COUNT,1                 ;CX = FILE NAME COUNT
                                            ;INCREMENT COUNT
READ_KEYBD:
            CALL    GET_KEY                 ;GET KEY INSTRUCTION
            MOV     AL,27                   ;ESCAPE KEY?
            JE      END_PGM                 ;YES, END PGM
;
; EXTENDED KEY TESTS
;
            CMP     AL,59                   ;FUNC KEY 1?
            JE      DEL_IT                  ;YES, DELETE FILE
            CMP     AL,71                   ;HOME KEY?
            JE      RESTART                 ;YES, RESTART
            CMP     AL,61                   ;PAGE DOWN?
            JE      SKIP_IT                 ;YES, SKIP NEXT FILE
            MOV     READ_KYBD               ;NO, IGNORE KEY
DEL_IT:
            PUSH    CX                      ;SAVE FILE NAME LENGTH
            MOV     SI,OFFSET FNAME         ;POINT TO FILE NAME
```

(Figure 1 continues)

■ PROGRAMMING/UTILITIES

```
        MOV     DI,OFFSET DELETE_PATH + 2    ;DELETE PATH FILE SPEC
        MOV     CX,13                         ;BYTES TO MOVE
        REP MOVS                              ;MOVE FILE NAME
        POP     CX                            ;RESTORE FILE NAME LENGTS
        ;
        CALL    DEL_RTN                       ;DELETE FILE
        JC      SOUND_ALARM                   ;CARRY SET - NOT DELETED
        ;
        MOV     DL,017                        ;'LEFT POINTER' CHAR
        CALL    CHAR_OUT                      ; AND PRINT
        INC     DX                            ;INCREMENT BYTE POINTER
        JMP     SKIP_IT                       ;SKIP TO NEXT FILE
        ;
SOUND_ALARM:
        MOV     DL,07                         ;CTRL-G 'BEEP' CHAR
        CALL    CHAR_OUT                      ; PRINT
        JMP     READ_KYBRD                    ;READ KEYBOARD AGAIN
        ;
SKIP_IT:
        CALL    SPACE_FILL                    ;POSITION FOR NEXT NAME
        CALL    NEXT_FILE                     ;FIND NEXT FILE MATCH
        JC      END_PGN                       ;CARRY SET = NO MORE FILES
        CMP     COUNT,88                      ;88 FILE NAMES DISPLAYED?
        JE      FILE_LOOP                     ;NO, SKIP SCROLL
        CALL    SCROLL_HALF                   ;SCROLL HALF DF WINDOW
        SUB     COUNT,48                       ;SUBTRACT 48 FROM FILE COUNT
        JNF     FILE_LOOP                     ;KEEP GDING
        ;
ERRDR_RTN:
        MOV     DX,OFFSET NOT_FOUND           ;POINT TO MSG
        CALL    FAT_ASCII5                    ; AND PRINT
END_PGN:
        INT     28H                           ;RETURN TO DOS
        ;
;****************  S U B R O U T I N E S  *************************
        ;
;GET NEXT PREAMTER BYTE AND COMPARE AGAINST DELIMITER TABLE
;   ZERO FLAG INDICATES BYTE IN AL IS DELIMITER
        ;
PARM_SCAN:
        PUSH    CX
        PUSH    DI
        LOOSB                                 ;GET BYTE AT DS:[SI]
        MOV     DI,OFFSET DELIM               ;POINT TO DELIM STRING
        MOV     CX,5                          ;LENGTH OF DELIM STRING
        REPNE SCASB                           ;SCAN DELIM UNTIL CX=0
        ;                                     ; OR AL=DS:[DI]
        POP     DI
        POP     CX
        RET
        ;
;GET CURRENT DIRECTORY PATH FOR DRIVE SPECIFIED
        ;
GET_PATH:
        PUSH    SI
        MOV     AX,847H                        ;GET CURRENT DIRECTORY
        MOV     DL,DRIVE_NO                    ;GET DRIVE NUMBER (B=A,ETC)
        MOV     SI,OFFSET PATH_SPEC + 1        ;DL = [B=DEFAULT, 1=A, ETC)
        INT     21H                            ;SAVE DIRECTORY TO DS:[SI]
        ;                                     ;DOS CALL
        SUB     AL,AL                          ;ASCIIZ ZERO BYTE
        MOV     [SI],AL                        ;CHECK IF ROOT DIR
        JZ      ROOT_DIR                       ;IF SO, SKIP SEARCH
        ;
        MOV     DI,SI                          ;SCAN PATH FOR SEX 8
        MOV     CX,64                          ;BYTES TO SEARCH
        REPNE SCASB                           ;DO SEARCH FOR TRAILING SERD
        DEC     DI                            ;DI POINTS TO END SERD
        MOV     AL,'\'                        ;OVERLAY WITH EACK SLASH
        STOSB                                 ;APPEND TO PATH
        ;
ROOT_DIR:
        POP     SI                            ;RESTORE INDEX
        RET
        ;
;FINDS NEXT FILE NAME WHICH MATCHES BASE
        ;
NEXT_FILE:
        PUSH    CX
        MOV     DX,OFFSET MATCH_PATH          ;ADDRESS DF MATCH STRING
        MOV     CX,8                          ;ATTRIBUTE DF FILES
        MOV     AH,84FH                       ;FIND NEXT MATCH
        INT     DOS                           ;DOS FUNC CALL
        POP     CX
        RET
```

(Figure 1 continues)

```
;SPACES OUT FILE NAME TO LENGTH OF 16 BYTES (FIVE NAME PER LINE)
;
SPACE_FILL:
        CMP     CX,16                   ;PRINTED 16 BYTES?
        JAE     SPC_EXIT                ;YES, EXIT
        MOV     DL,' '                  ;NO, PRINT SPACE AFTER NAME
        CALL    PRT_CHAR                ;PRINT CHAR
        INC     CX                      ;INCREMENT CX (STRING COUNT)
        JMP     SPACE_FILL              ;KEEP GOING
SPC_EXIT:
        RET
;
;PRINTS ASCIIZ STRING POINTED TO BY DS:DE
;  CX RETURNS NUMBER OF BYTES PRINTED
;
PRT_ASCIIZ:
        PUSH    SI
        PUSH    DX
        MOV     CX,CX                   ;INIT BYTE COUNT
        MOV     SI,DE                   ;SET SOURCE INDEX
ASC_LOOP:
        MOV     DL,BYTE PTR [SI]        ;POINT TO CHAR IN ASCIIZ
        CMP     DL,0                    ;FOUND TRAILING ZERO?
        JE      ASC_EXIT                ;YES, EXIT
        CALL    PRT_CHAR                ;NO, PRINT CHAR
        INC     SI                      ;POINT TO NEXT BYTE
        INC     CX                      ;INCR BYTES PRINTED
        JMP     ASC_LOOP                ;KEEP GOING
ASC_EXIT:
        POP     DX
        POP     SI
        RET
;
;PRINTS CHARACTER IN DL
;
PRT_CHAR:
        PUSH    AX
        MOV     AH,2                    ;PRINT CHAR IN DL
        INT     DOS                     ;DOS FUNC CALL
        POP     AX
        RET
;
;ACCEPT ONLY ESCAPE, AND ALL EXTENDED KEY CODES
;
GET_KEY:
        MOV     AH,0                    ;GET NEXT KEYBOARD CHAR
        INT     16H                     ;BIOS CALL
        CMP     AL,27                   ;ESCAPE KEY?
        JE      GET_EXIT                ;YES, EXIT
        CMP     AL,0                    ;EXTENDED KEY?
        JNE     GET_KEY                 ;NO, IGNORE
        XCHG    AH,AL                   ;SWAP SCAN CODE INTO AL
GET_EXIT:
        RET
;
;DELETES FILE NAME IN FIELD 'FNAME'
;  CARRY FLAG SET - FILE COULD NOT BE DELETED
;  CARRY FLAG CLEAR - FILE WAS SUCCESSFULLY DELETED
;
DEL_RTN:
        MOV     DE,OFFSET DELETE_PATH   ;POINT TO DELETE PATH
        MOV     AH,041H                 ;DELETE FILE FUNC
        INT     DOS                     ;DOS CALL
        RET
;
;CLEARS ENTIRE SCREEN AND POSITIONS CURSOR IN UPPER LEFT CORNER
;
CLR_SCR:
        MOV     AH,2                    ;SET CURSOR POSITION
        MOV     BH,APAGE                ;SET CURR PAGE
        MOV     DX,0                    ;UPPER LEFT CORNER
        INT     VIDEO                   ;BIOS CALL
;
        MOV     BH,ATTR                 ;ATTRIBUTE TO BH
        MOV     AH,06H                  ;SCROLL UP ENTIRE FUNC
        MOV     CX,0                    ;UPPER LEFT WINDOW CORNER
        MOV     DX,1850H                ;LOWER RIGHT CORNER 24 X 80
        INT     VIDEO                   ;BIOS CALL
;
;SCROLLS TOP HALF OF FILE DISPLAY AREA AND POSITIONS CURSOR ON BLANK LINE
;
SCROLL_HALF:
        MOV     AH,2                    ;SET CURSOR POSITION
        MOV     BH,APAGE                ;SET CURR PAGE
        MOV     DX,0F00H                ;PUT CURSOR ON LINE 15
        INT     VIDEO                   ;BIOS CALL
```

(Figure 1 continues)

PROGRAMMING/UTILITIES

```
        MOV     RR,ATTR          ;ATTRIBUTE TO RR
        MOV     AX,0608H         ;SCROLL UP RIGHT LINES
        MOV     CX,0709H         ;UPPER LEFT CORNER OF WINDOW
        MOV     DX,185FH         ;LOWER RIGHT CORNER 24 X 80
        INT     VIDEO            ;BIOS CALL
        RET

CSEG    ENDS
        END     ENTRY
```
                                                    (Figure 1 ends)

```
100 REM -- BASIC PROGRAM TO CREATE XDEL.COM
110 OPEN "XDEL.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR J% = 1 TO 118
150   LINESUM = 0
160   FOR J% = 1 TO 7
170     READ BYTE%
180     CHECKSUM = CHECKSUM + BYTE%
190     LINESUM = LINESUM + BYTE%
200     IF (BYTE% < 256) THEN LSET A$ = CHR$(BYTE%)
210     PUT #1
220   NEXT J%
230   READ LINECHECK
240   IF LINECHECK <> LINESUM THEN PRINT "Error in Line";200 + 10 * J%
250 NEXT J%
260 CLOSE
270 IF CHECKSUM = 80160 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
200 DATA 233,  245,    1,   67,  111,  112,  121,  114,  1084
300 DATA 105,  103,  104,  116,   32,   40,   57,   56,   622
310 DATA  54,   32,   80,  105,  102,  103,   45,   68,   590
320 DATA  97,  116,  105,  115,   32,   80,  117,   60,   762
330 DATA 105,  105,  115,  104,  105,  110,  103,   32,   782
340 DATA  67,  111,   46,   36,    0,   55,   94,   84,   483
350 DATA  0,    0,    0,    0,    0,    0,   46,   46,   207
360 DATA  61,    0,    0,    0,    0,   82,    0,    0,   153
370 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
380 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
390 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
400 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
410 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
420 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
430 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
440 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
450 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
460 DATA  0,    0,    0,    0,    0,    0,    0,    0,     0
470 DATA  50,   42,   46,   42,    0,    0,    0,   65,    65
480 DATA  0,    0,    0,    0,    0,    0,   13,   10,    23
490 DATA  0,    0,    0,  111,  109,  101,   32,   45,   32,  512
500 DATA 102,  105,  114,  115,  116,   32,  102,  105,   781
510 DATA 108,  101,   32,  100,  111,   32,  110,   46,   784
520 DATA  32,   32,   32,    0,   32,  118,  101,  128,   618
530 DATA 108,   60,   10,   32,   45,   32,  118,  101,  526
540 DATA 116,   32,  102,  105,  105,   32,  110,  109,   709
550 DATA  87,   16,   99,  104,  104,   32,   13,   10,   741
560 DATA  46,   32,   32,   32,   32,   45,   32,  100,   423
570 DATA 108,  100,   32,  116,  101,   32,  100,  101,  775
580 DATA 114,   32,  102,  105,  105,  101,   32,  115,   717
590 DATA 104,  111,  116,  110,  110,    0,    0,    0,   551
600 DATA  63,   67,   32,   32,   45,   32,   60,   67,   400
610 DATA 108,   60,   27,   32,  118,  101,   32,  68,   576
620 DATA  83,   13,   10,  285,  285,  285,  285,  285,  1131
630 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
640 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
650 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
660 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
670 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
680 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
690 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
700 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
710 DATA 285,  285,  285,  285,  285,  285,  285,  285,  1640
720 DATA  85,   32,   32,   32,    0,    0,    0,    0,   655
730 DATA 104,   32,   32,   32,   32,   60,   73,   62,   626
740 DATA  67,   84,   74,   82,    0,   33,   80,   85,   500
750 DATA  82,   71,   60,   32,   85,   84,   73,   76,   572
760 DATA  73,   84,   04,   80,   13,   10,   67,  117,  554
770 DATA 114,  114,  110,  116,  116,   32,   68,  105,  754
780 DATA 114,   10,  016,  111,  114,  121,   32,   50,   752
790 DATA 114,   10,    0,    0,   16,   14,   32,    0,   315
800 DATA 112,  105,  100,  101,   13,   10,  111,  114,  721
810 DATA  32,  122,  111,  117,  110,  100,    0,    0,   592
820 DATA  19,   73,  110,  110,  118,   07,  108,  105,  1001
830 DATA  32,  108,  114,  105,   71,   11,  111,   47,   645
```

Figure 2: A BASIC program that will automatically create XDEL.COM.

                                                    (Figure 2 continues)

```
-840 DATA    32, 102, 105, 108, 101,  32, 115, 112, 787
850 DATA   101,  99, 105, 102, 105,  99,  97, 116, 624
860 DATA   105, 111, 110,  13,  10,  69, 114, 101, 764
870 DATA   110, 103,  58,  32, 108, 105, 114, 101, 766
880 DATA    98, 116,  32, 111, 114, 121,  32,  98, 792
882 DATA   105, 111, 111, 101, 101, 102, 121, 115, 995
890 DATA   118, 103,  32,  80,  80,  69,  76,   0, 546
910 DATA   100, 107,   2, 232,  86,   1, 285,  32, 911
920 DATA   100,   0,   0, 205,  16,  16, 232,  44,   1, 652
930 DATA   180,  62, 205,  16,   8,   1, 117,   4, 136, 490
940 DATA    30,  50,   1, 252, 198, 128,   0, 191, 851
950 DATA    60,  13, 212, 227,   0, 116, 251,  78, 973
960 DATA    68,  43, 116,  12, 128, 246,   1,  58, 512
970 DATA   127,   6, 173,  36, 223, 235,   9, 144, 943
980 DATA   200,  25, 285,  33,   4,  65, 100,  58, 797
988 DATA    68,  65, 114, 108, 108,  98, 119, 104, 800
1000 DATA   171, 191, 120,   1, 171, 191, 143,   1, 997
1010 DATA   171,  46,  65, 162,  57,   1, 120,  60, 680
1020 DATA    13, 116,  25, 185,  12,  8, 232, 277, 760
1030 DATA    18,   0, 116, 251,  68,  13, 116,  10,  68, 626
1058 DATA   277, 190,  5,  8, 232, 169,   8, 232, 1073
1060 DATA   231,   1, 186,  93,   2, 232, 228,   0, 757
1070 DATA   166, 147,   2, 232, 214,  58, 186, 91, 1025
1080 DATA     1, 232, 200,   8, 186,  61, 116, 232, 921
1090 DATA   282,   8, 186, 145,   2, 232,  74,   0, 962
1100 DATA   186, 154,   1, 232, 198,   0, 196,   0,  91
1110 DATA    51,   1,   0,   0, 146, 143,   1, 185,   0, 547
1120 DATA     0, 100,  78, 285,  33, 114,  90,  1, 186, 087
1130 DATA   150,   4, 232, 167,   0, 128,   6,  51, 742
1140 DATA     1,   1, 232, 189,   0,  60,  27, 116, 626
1150 DATA   179,   0,  59,  27, 116,  10,  68,  71, 116, 571
1160 DATA   174,  60,  81, 116,  36, 235, 235,  61, 1010
1170 DATA   190, 150,   8, 191, 132,   1, 195,  33, 060
1180 DATA     0, 243, 164,  09, 232, 170,   8, 232, 1012
1190 DATA   139, 178,  17, 232, 141,   0,  65, 232, 877
1200 DATA   156, 144, 178,   7, 232, 132,   0, 235, 936
1210 DATA   281, 232,  90,   8, 232,  74,   0, 114, 943
1220 DATA   232, 120,   62,  51,   1,  80, 114, 275, 634
1230 DATA   232, 107,   8, 120,  46,  51,   1,  48, 667
1248 DATA   235, 165, 106, 150,   2, 252,  51,   1, 846
1258 DATA   245,   1,  98,  87, 232, 101, 114,  52,   1, 821
1270 DATA     5,   5,   0, 242, 174,   5, 186, 235, 505
1278 DATA    96, 100,  71, 138,  22,  57,   1, 254, 060
1288 DATA   194,  90,   2,  65,  1, 285,  33,  42, 192, 519
1290 DATA    54,   1, 116, 111, 234, 285,  64, 628
1308 DATA     8, 242, 174,  79, 176,  92, 190,  94, 1027
1310 DATA   195, 152, 186,  41, 285,  33,  40, 116, 781
1328 DATA   108,  73, 232,  33,  0, 195, 131, 146, 1161
1338 DATA   16, 164,  15, 276, 232, 232, 232,  0, 680
1340 DATA   65, 235, 242, 195,  86, 032,  43, 201, 150
1350 DATA   1009, 222, 138,  20, 128, 288,   8, 116, 1033
1360 DATA    7, 232,  7,  0,  70,  65, 235, 242, 050
1370 DATA   190,  94, 195,  60, 188,   2, 205,  33, 679
1388 DATA    11,   0, 285,  33, 140,   0,  8,   3, 777
1390 DATA   285,  16,  60,   0, 117, 242, 134, 224, 981
1400 DATA   195, 285,  33,   2, 180, 245, 285,  33, 593
1410 DATA   285, 180,   3, 130,  62,  44,   1, 186, 080
1428 DATA     0,  8, 285,  16, 105,   8,   8, 106,  80, 641
1440 DATA   285, 246, 285,  16, 195, 100,   2, 138, 622
1450 DATA   132,   9,  1, 186,  8,  15, 285,  16, 138, 645
1460 DATA   180,   8, 232, 170,   1, 146, 242, 695
1470 DATA    7, 186,  08,  24, 205,  16, 195,  67, 713
```

(Figure 2 ends)

and the Escape code (1Bh). The main program loop checks the value returned from GET_KEY and branches to the appropriate part of the program. Although DOS itself provides an interrupt to read the keyboard, the BIOS interrupt is more useful here because the DOS routine may not take the appropriate action if ANSI.SYS is loaded and keys are redefined for DOS.

BE CAREFUL WITH F1 When you want to delete the last file shown on the screen, hitting the F1 function key starts the ball rolling. XDEL builds an ASCIIZ string by concatenating the filename to the drive specification and then using the DOS Function Call 41h. DOS sets the carry flag if the file cannot be deleted (e.g., is read-only). When the file is deleted, a left pointer symbol is written to the screen and the next file is displayed; otherwise, a beep tone is generated by instructing DOS to "write" a hex 07 character and the cursor remains at the current screen position. When DOS "deletes" a file, it does not destroy the contents of that file, but only the ability to access it through normal means. The disk directory entry associated with the file is flagged as deleted and the FAT (file allocation table) is updated to re-

turn all associated disk sectors to the available pool. Until those sectors are used (by new files or updates), it is possible to rebuild the directory entry and reestablish the FAT information by using utility programs like Peter Norton's Unerase. Even so, be advised that F1's effect is instantaneous and that resting your elbow on the F1 key is definitely inadvisable.

SCREEN-HANDLING ROUTINES
XDEL counts the number of filenames currently displayed, and when the screen fills up, its lower part is partially scrolled

> ■ Ambitious programmers could enhance XDEL for operations like renaming a file or changing its attribute.

without disturbing the screen header information. This is accomplished by specifying a window area to be scrolled and then invoking the BIOS Video Interrupt. The window is defined by providing the upper-left and lower-right row and column positions of the area to be scrolled. All text displayed on the screen is handled by the PRT_ASCIIZ and PRT_CHAR routines. PRT_CHAR utilizes the DOS display output Function Call 02h. PRT_ASCIIZ relies on the SI register to provide the starting point of a character string to be printed and proceeds to the next byte until a zero byte is found. The SPACE_FILL routine is simply that: it pads the filenames to the same length, thus facilitating their presentation to exit at any time.

Ambitious programmers could enhance XDEL to allow for such operations as renaming a file or changing its attribute. Maybe an XDEL Version 1.1a will do these things—or perhaps the next version of DOS will.

Ronald Czepala is a COBOL programmer who has acquired much of his assembler knowledge from these columns.

NOW, POWERFUL WITHOUT POWE

A typical DBMS user's screen, after the 497th line of code.

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With most database management software for the IBM PC family and compatibles, you're quickly confronted with a painful reality: the only way to make your package live up to its promise is to learn its programming language. Which can take months. Then you have to write the code, line after frustrating line.

But now, there's R:BASE™ System V. And for the first time, you can quickly create programs that automate your most important data management tasks. Without programming.

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R:BASE SYSTEM V. IT GIVES NON-PROGRAMMERS POWERFUL PROGRAMS.

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you can build a database structure with advanced features like computed columns, and *searchable* note fields. VIEWS that combine up to five tables in a single, powerful table. Data validation rules that check incoming data for errors. All without programming.

Then you can use Forms EXPRESS to create customized data entry forms. The forms you create can load data into five different tables, linked in One-To-Many relationships. You can also include scrolling regions, custom borders, and custom colors, all without programming.

And with Reports EXPRESS, you can design reports exactly the way you want. And see what they'll look like, right on the screen. To see how complex your reports can be, take a close look at the example at the end of this page.

Finally, you can tie it all together with Application EXPRESS. First, you design your own multi-level system of menus. Your first menu level might look like this:

```
Aunt Betty's Sales Reporting System
(1) Enter Sales Data
(2) Edit Sales Data
(3) Print Daily Sales Report
(4) File Processing
(5) Exit
```

For each menu choice, you assign an action. For example, to define

menu choice #3, choose the action "PRINT," select the report you just created in Reports EXPRESS, and specify the appropriate data sorting and selection criteria. Then Application EXPRESS automatically writes the program code.

Which means you've just created a very sophisticated program to deliver the full power of your DBMS. And you've done it all without learning how to program. From this point on, every time you want to run a report, all you do is choose item #3. With one simple keystroke, you've got it.

R:BASE SYSTEM V. IT GIVES PROGRAMMERS A POWERFUL ENVIRONMENT.

If you're an experienced programmer, you can use R:BASE System V to tackle the most demanding applications. You can use Application EXPRESS to create prototypes faster than with any other microcomputer-based DBMS.

There's a high-level procedural language, and a full set of relational operators that can leverage up to 80 tables, all of which can be open at once. While you're racing along, a data dictionary

■ JARED TAYLOR

SPREADSHEET CLINIC

Converting numbers to words, how to make better best guesses with @NA, and an autoexec macro that runs on the Friday before the end of the month.

FRACTIONS TO DECIMALS

In the Spreadsheet Clinic of April 15, 1986 (Volume 5 Number 7), you included a method for entering stock prices without converting the fractional part to a decimal. *[The technique is to enter a number such as 8⁷/₁₆ as the formula 8+⁷/₁₆, which will appear in the cell as 8.4375. This is a lot easier than calculating the value of ⁷/₁₆ before entering the entire number as a decimal.—Ed.]* Figure 1 shows a way to do the same thing with fewer keystrokes.

Assume that you must enter the fractional values contained in column C. You would enter the data as in column B, that is, the integer part of the column C value with *only the numerator* of the fraction as the number following the decimal point.

The formula in column E converts the column C values to fractions. You put the denominator common to all the fractions in cell E3 and copy the formula in cell E8 down the column. The only trick is remembering to enter 8½, for example, as 8.4, since ⁴/₈ is the same as ½. If you need to use a different denominator, such as 16 or 32, just put it in cell E3.

Don Harris
Friendswood, Texas

Not so fast. This method works fine for single-digit denominators, but not for two-digit denominators, such as ¹/₃₂. When you have a two-digit denominator, you can also get a two-digit numerator, which means you get two digits to the right of the decimal place when you enter your data. Thus you have to multiply by 100 in your equation instead of by 10. I have included

Figure 1: *A way to enter fractions as decimals to get decimal values.*

an alternative equation that tests for the length of the numerator and multiplies by 100 or by 10 as necessary. If you use this equation, though, you must enter 3¹/₃₂ as 3.03 rather than 3.3 because 3.3 will be treated as 3³⁰/₃₂.

SKIPPING CELLS WHEN YOU COPY

I have used *1-2-3* and *Symphony* for several years but only recently discovered how to copy cell contents along rows or columns while skipping every other cell.

To illustrate the process, enter the number 1 in cell A1. In cell A3 type in the formula +A1+1. Now do a /Copy, specifying A3. A20 as the source range and A5 as the destination range. The formula will be copied into every other row, through A21. If you want to put two blank rows between every copied formula, just enter +A1+1 in cell A4 and make A7 your destination range.

This technique works whether you copy ranges or single cells and whether you copy vertically or horizontally.

Robert DePriest
Nashville, Tennessee

Amazing but true! There must be some quirk in the Lotus copy algorithm that in effect lets you enter the destination range as the source range. The technique is perfect for those ticklish situations in which you must change every third or fourth column or row. Nice tip.

NUMBERS TO WORDS

Figure 2 shows a macro that will parse dollar values up to $999,999.99 and write them out in words. Put the number in D3, hit Alt-C, and the words will appear in D5. Be sure to include the lookup table and all the range names as specified. This macro will work with *Symphony* or Release 2.0 of

■ SPREADSHEET CLINIC

1-2-3; it is an adaptation of a dBASE II rou-tine by Alan Simpson.

Peter R. McBride
Moorpark, California

Mr. McBride included some brief program comments with his submission, but I left them out so that the listing would fit on the page. Hard-core macro decipherers will have fun with this one.

BETTER-GUESSING @NA

The @NA function in *1-2-3* is useful when you have to build a model before you have the necessary data. @NA in a cell will hold that cell open until you have the data you need. However, this is inconvenient if you want to see best-guess figures, since every formula that refers directly or indi-rectly to an @NA cell also shows the value NA. The easy—and dangerous—solution is to enter a best-guess value instead of @NA. That way you have provisional re-sults, but it's easy to forget which values in your model were guesses rather than real data.

An alternative solution is to give any best-guess cells the +/- format. That way you can tell at a glance which cells are guesses, but their values will feed correctly through to the rest of the spreadsheet.

If you're not willing to hazard a guess at data that's yet to come, you can always en-ter a label such as MISSING instead of a number. In Release 1A, at any rate, the la-bel will be treated as a zero. This method of handling the label will understate totals and will also throw off any averages you may be calculating with this data. To cor-rect the average you can multiply it by a correction factor as follows:

```
@count (range being averaged)/(@count (same
range)−(no. of missing values))
```

One good way to correct both problems is to let the data you already have predict the data you don't yet have. If, for exam-ple, you have a hole in a column of num-bers, plug it with @avg(RANGE), using the entire column as the range. This will give more-realistic totals and will not change averages. Unfortunately, it will also give you a CIRC message. If you don't have any other circular errors in your worksheet, just consider the message a re-minder that you have incomplete data. It's

Figure 2: *A macro that converts numbers into words.*

also a good idea to flag the cell with the +/-format so you can find it easily.

When you first use @avg(RANGE) to fill in the blanks, its value may be slightly different from any other average you have calculated for that range. This is because of the circular reference; the values will converge after a few recalcs.

John Predmore
Fairport, New York

You can use Mr. Predmore's @av-g(RANGE) technique even if you have more than one hole in a column of num-bers. Nine out of ten figures in a column could be @avg(RANGE) and the method will still work—it just takes more recalcs before all the values in the column take on the value of the one piece of real data. And if you're really hurting for data, enter @avg(RANGE) in the tenth cell, too.

A more conventional way to keep @NA from running wild through your spread-

sheet is to control it with @ISNA. Thus, if you expect that B7 is likely to be NA, you could put something like this into a cell:

```
@if(@isna(b7),F4,500)
```

That way, if B7 turns out to be NA, you'll get the value in F4. Otherwise you'll get the number 500.

MORE ON AUTOEXEC MACROS

In Spreadsheet Clinic for March 25, 1986 (Volume 5 Number 6), you ran an item about controlling *1-2-3* autoexec macros so that they would run on Fridays only. In Volume 5 Number 14 you included an au-toexec macro that will run only at the end of the month.

However, a macro like that won't do much good for a business that operates on weekdays only. If the end of the month falls on Saturday or Sunday, you want to ensure that the macro will run on the pre-ceding Friday.

Figure 3 solves the problem. The formulas in cells D3 through D7 are formatted as text, but each is a simple true/false test that evaluates to 1 or 0. FRIDAY _TEST will be 1 only on Friday. LAST _TEST will be 1 if today is not the last day of the month. The other two formulas also will be 1 if the last day of the month doesn't fall on the day following today or on the day two days from today. The autoexec macro decides whether to run by evaluating these formulas.

The first line aborts the macro if today is any day other than Friday (FRIDAY _TEST=0) *and* it is not the last day of the month (LAST_TEST=1). The second line aborts the macro if all the test formulas evaluate to 1, making the sum in STOP _TEST equal to 4. STOP_TEST equals 4 when all of the following four conditions are true:

(1) Today is Friday.

(2) Today is not the last day of the

month.

(3) Tomorrow (Saturday) is not the last day of the month.

(4) Two days from today (Sunday) is not the last day of the month.

With these two sets of restrictions on its operation, the macro will run only on the last weekday of every month.

Michael Frank
Hudson, Ohio

Very nicely done.

```
      C                    D
3  FRIDAY_TEST      @MOD((TODAY),7)=6
4  LAST_TEST        @DAY((TODAY)(<@DAY((@TODAY+1)
5                   @DAY((TODAY)+1)<@DAY((@TODAY+2)
6                   @DAY((TODAY)+2)<@DAY((@TODAY+3)
7  STOP_TEST        @SUM(D3..D6)
8
9  \8              /siFRIDAY_TEST=0#and#LAST_TEST=1~/sq
10                 /riSTOP_TEST=4~/sq
11                     . . . Regular Autoexec Macro
                         Continues Here . . .
```

Figure 3: An autoexec macro that runs only on the last weekday of the month.

■ EDITED BY CRAIG L. STARK

POWER USER

Adapting PSET.COM to control printers from dBASE, undocumented features and fixes for Microsoft Word, and bringing SideKick's Notepad up to date.

WORKING DAY CALCULATOR
The enclosed program, WORK-DAYS.PRG (shown in Figure 1), uses *dBASE's* DOW() function to calculate elapsed business days (excluding weekends and company holidays) between any two dates. This is very useful, for example, in determining how long it takes to process insurance claims, how long it takes for sales to show up in bank deposits, etc. It can also help in projecting lead times for scheduling production or in writing proposals.

If you declare the opening variables PUBLIC rather than PRIVATE, the results will be available to the calling program.

Shirley Chin
Newark, New Jersey

Ms. Chin's program is indeed useful, and to widen its possibilities further I've added a few lines so you can use it to forecast a future promise date, and also so you can pass the parameters as date variables as well as character strings. The resulting program handles a variety of inputs.

To use WORKDAYS.PRG for calculating business days elapsed, you pass two parameters—the start and end dates—to the program:

```
DO workdays with "84/86/86","85/86/86"
```

Note that the final /86 may be omitted from either or both character strings. You can also pass date variables: dBASE's TYPE() function is used to determine what kind of input you've passed, and if it's a

string, it is converted to date format. The five lines of code in Figure 1 that begin IF LEN(p1)=5 can be replaced with this one-line IIF() statement if you're using dBASE III Plus:

```
p1=CTOD( IIF(LEN(p1)=5,p2+"/"+STR(YEAR(DATE())-1988,2),p1) )
```

If you'd like to use WORKDAYS to calculate promise dates, the first parameter is the start date as shown above, and the second is the number of business days until delivery. For example,

```
DO workdays with "85/28", 35
```

```
*** WORKDAYS.PRG    Calcs bus days elapsed, past or future
* p1 may be 5 or 8 character or a dBASE date.  p2 may also be a number
PRIV holidays,days,start,end
PARA p1,p2
SET TALK OFF
STOR # TO start,days
holidays='81/81, 82/17, 85/26, 87/84, 89/81, 18/13, 11/27, 11/28, 12/25, 12/26'
IF TYPE('p1')='C'
    IF LEN(p1)=5
        p1=CTOD(p1+"/"+STR(YEAR(DATE())-1988,2))
    ELSE
        p1=CTOD(p1)
    ENDIF
ENDIF p1 is a date if it entered as a string

IF TYPE('p2')$'CD'
    * if p2 is a string or data...
    IF TYPE('p2')='C'
        IF LEN(p2)=5
            p2=CTOD(p2+"/"+STR(YEAR(DATE())-1988,2))
        ELSE
            p2=CTOD(p2)
        ENDIF
    ENDIF p2 is now a data
    start=p1
    DO WHIL start<p2
        IF DOW(start),1)$'23456' .AND. .NOT. SUBE(DTOC(start),1,5)$holidays
            days=days+1
        ENDIF
        start=start+1
    ENDDO
    ? 'Work days between',p1,"&",p2,"-"+STR(days,4),"days."
ELSE
    * if p2 was a number...
    end=p1
    DO WHIL days<p2
        IF STR(DOW(end),1)$'23456' .AND. .NOT. SUBES(DTOC(end),1,5)$holidays
            days=days+1
        ENDIF
        end=end+1
    ENDDO
    DO WHIL DOW(end),1)$'17' .OR. SUBES(DTOC(end),1,5)$holidays
        end=end+1
    ENDDO
    ? p1,"plus"+STR(p2,4)+" work days:",end
ENDIF
```

Figure 1: A dBASE III procedure to calculate business days elapsed and/or future promise dates.

■ POWER USER

The program will return 07/17/86, 35 weekdays (excluding Memorial Day and the 4th).—Brad Stark

PSET IN dBASE

Since most of the work in our office is done in *dBASE III* using four different printers, I translated John Dickinson's excellent PSET.COM (Power User, Volume 5 Number 8) into *dBASE*. PSET.PRG (shown in Figure 2) can be called from the dot prompt or directly from a program, and the syntax is the same as for PSET .COM, with one exception: in *dBASE*, the control codes are passed as a parameter, so they must be enclosed in quotes. For example, the sequence ESC E ESC G sets my Epson to print double-strike/emphasized. To send this command in *dBASE* you use

```
. do pset with "27 69 27 71"
```

The control codes are accepted by the printer without moving the printhead, so you can change type sizes or enhancements on the same print line—up to *dBASE*'s built-in limitation of 264 characters per command line. The CONSOLE is SET OFF so the proceedings don't muddle up your screen with that screwball crew of characters under CHHR(32)!

Edie Coletti
Cohasset, Massachusetts

It's certainly handier to call PSET.PRG than to RUN PSET.COM, even if you have the memory available. It's faster, too. I

```
*** PSET.PRG - Sends codes to a printer
PRIV incoming,pset,loc,seq
PARA incoming
SET CONS OFF
pset=incoming
DO WHIL " "$pset
   loc="AT"," ",pset)
   seq="CHR("+SUBS(pset,1,loc-1)+")"
   SET PRIN ON
   ?? seq
   SET PRIN OFF
   ?? seq
   SET PRIN OFF
   ?? seq
   SET PRIN ON
   ?? seq
   SET CONS ON
ENDO
seq="CHR("+pset+")"
SET PRIN ON
?? seq
SET PRIN OFF
SET CONS ON
RETU
* incoming parameter uses the space as
* delimiter
* Printer must be online
```

Figure 2: *This dBASE III program sends control codes to change printing characteristics—even in the middle of the same print line.*

gather Ms. Coletti cares about speed since she writes her code in the lean-and-mean style—with four-letter abbreviations, short variable names, tight indents, and comments under the RETURN where dBASE won't hang around reading them.

I hope she won't mind my adding the line "pset=incoming". In this way, the incoming parameter doesn't get eaten in the DO WHILE loop. So, for example, you could

```
. STOR "27 69 27 71" TO dubblod
. DO PSET WITH dubblod
```

Notice that if you're passing a memory variable as the parameter, don't enclose it

■ The PgUp/PgDn trick is an undocumented feature of *Word's* window color selector logic.

in quotes. If you do, PSET will dutifully shout CHR(dubblod) at your printer and—worse—your printer will hear!

There's a lot you can build onto PSET if you want to. You could STORE complete sets of parameters at the beginning of a program or in a procedure file. Or you could save them in a .MEM file, RESTORing them as needed. This is what I've done—it's very useful if you often switch between printers.—Brad Stark

EGA GETS THE WORD

I've discovered a trick that is useful to people who use *Microsoft Word* command with with IBM Enhanced Graphics Adapter and Borland's *SideKick*. When you activate *SideKick* while running *Word* in graphics mode (and who wouldn't with an EGA?), the color palette gets clobbered upon leaving *Word*, and your screen's colors will not be the way you had them. Sometimes (although not always) the color is so far off that you can't even read your text and *Word's* menu.

The solution is easy enough that you can fix the problem even if you can't see what you're doing. Press the Esc key to ac-

tivate *Word's* menu, select Window Options (using first the W, then the O, keys), then press the Tab key once, at which point you will have selected Background Color. Press any cursor key to get *Word's* color bar menu.

Now for the trick: Press the PgUp and PgDn keys to reset the palette to the color you want. You'll find yourself looking at 64 color choices, which is a nice find all by itself. When you return to *Word's* text screen, you'll find that everything has cleared up.

Bradley Dyck Kliewer
Minneapolis, Minnesota

Good detective work! The PgUp/PgDn trick is an undocumented feature of Word's window color selector logic. You can also use it to set the menu color by selecting it first, then selecting a primary foreground color in the usual way.

There are two changes you should be aware of when you upgrade to Word 3.0. First, there is a new (again, undocumented) key combination that causes Word 3.0 to repaint the screen after a resident program has messed things up. Just press Ctrl and Shift, along with the backslash (\) key. Unfortunately, that doesn't always work with SideKick (although it does with other programs, such as ProKey 4.0), so Mr. Kliewer's trick will again have to be used. Word 3.0, however, requires three presses on the Tab key to get to the color selector in the Window Options menu.
—John Dickinson

PATCHING SIDEKICK'S NOTEPAD

If you use *SideKick's* Notepad for letter writing, you'll find its time- and date-stamp feature can be very useful. Typing Ctrl-Q-T automatically enters the time and date in the letter. Alternatively, if the Notepad window is saved with the entry ".LOG" at column 1 and row 1, the time and date will be entered every time the window is opened.

This feature can be even more useful for letter writing if you patch *SideKick* to enter the date without the time. Put a disk with DEBUG in drive A: and a copy of *Side-Kick*, Version 1.52, in drive B:, and type in the following from the A> prompt. End each line with a carriage return, including the blank line between NOP and W.

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■ POWER USER

```
DEBUG SK.COM
A 46F4
JMP 472A
NOP

W
Q
```

Ctrl-Q-T or the .LOG command will now retrieve the date only.

Also, in some countries, the standard format for the date is day/month/year instead of the American format of month/day/year. This is another easy patch to

■ If you use *SideKick's* **Notepad for letter writing, you'll find its time- and date-stamp feature can be very useful.**

make, either by itself or along with the first patch. Follow the same procedure (there are two blank lines this time), typing in the lines below:

```
DEBUG SK.COM
A 4739
MOV BL,DL

A 4745
MOV BL,DH

W
Q
```

Ctrl-Q-T or the .LOG command will now retrieve the date in day/month/year format.

Name Withheld

Both these patches work as advertised on SideKick, Version 1.52a. For those who haven't used the .LOG feature, be forewarned that the LOG must be in uppercase, and the file must have been saved with the .LOG extension before the feature does anything.—M. David Stone

■ POWER USER

SAFETY FIRST

Before upgrading to *dBASE III Plus*, you should first install the program in a separate subdirectory so you can test whether your existing Version 1.1 programs will still run. If you want to run *Plus* with your old programs, one immediate change you'll want to make is to remove the STATUS=ON and HELP=ON lines from *Plus*'s standard CONFIG.DB file.

By installing *Plus* in this tentative way, you can switch back to the older, tested version simply by loading it from its own directory. Later, when you're absolutely convinced, you can deinstall both versions and put *Plus* on the normal directory from which you've loaded *dBASE* in the past.

Nolen Richardson
Hartsville, South Carolina

Right on. As its name implies, there is far less difference between dBASE III Plus and dBASE III than between III and II. In fact, there is very little in the new version that will cause problems with your older programs—but there are some gremlins!

For example, SET COLOR TO commands now use letters instead of numbers. Any applications that use screen enhancements such as underline or reverse video for clarity must be revised; and, once revised, they won't run properly in the older dBASE.

There's no free lunch and no free feature. Plus takes more free space as much disk space—up from 149K to 312K. The old standard workstation—a dual floppy system with dBASE and applications programs on drive A: and data on drive B:—is strictly a thing of the past. dBASE III Plus takes more operating memory, too. If you have only 256K, you're up a creek: while Ashton-Tate supplies a paddle in the form of a bare-bones CONFIG.DB, memory is strictly rationed and there's little available for such memory-intensive functions as indexing and sorting. If you couldn't work a day without resident programs like ProKey or SideKick, you're strictly out of work until you add more RAM.

There are lots of little things to complain about. The report and label generators are simply terrible: while adding no new capabilities, they give you much less information and require many more steps to complete the same work. In the interactive mode, the cursor jumps to line 24 each time the dot prompt appears. This makes it difficult or impossible to leave information on the screen while you ask questions, make replacements, etc.

Yes, Plus is a significant upgrade with many powerful new features. In many respects, Ashton-Tate has expanded its market downward by making dBASE easier for novices, and upward by giving professionals more control and many new functions. It's wonderful . . . but! So if you have enough disk space and can arrange to "run dual" with both versions installed for a while, take Mr. Richardson's advice and do it.—Brad Stark

EASIER MACRO CREATION

Sometimes I need to record a complicated macro for use with several *WordPerfect* files. For example, I may need to do a series of global search-and-replace operations on each of 15 chapters in a book. Setting the macro up on the first file can be time-consuming—especially on a long file. However, I've hit on a simple solution.

By opening a dummy file only a few words long, you can program the entire macro as quickly as you can type it. Simply go through all the motions, recording the keystrokes. The dummy file is so short that otherwise-tedious search-and-replace operations take essentially no time. Once you finish recording the macro, switch to the files you want to modify and let the macro run while you do other things.

Two notes of caution: First, map out all the steps you want to take. Second, in recording the macro, you must act as if cer-

■ If you start your word processor with a blank screen, you can record the macro with no words in the document at all.

tain actions have taken place. For example, if a global replace on the dummy file has not found any target words, the cursor will remain at the beginning of the text, but you must still program it in the repositioning to the top of the file (<Home> <Home> <Up Arrow>) so that the macro will work properly in your actual files.

Samuel Himelstein
Jerusalem, Israel

This is a useful tip that can be applied to almost any word processor, whether it has its own macro facility or whether you're using it with ProKey or the like. But the dummy file as you've described it seems like excess baggage.

If you open an empty file or, alternatively, start your word processor with a blank screen, you can record the macro with no words in the document at all. And if your word processor can handle more than one document at a time—as WordPerfect can—you can switch to an empty document to record the macro (hit Shift-F3 in WordPerfect). Either way, you've succeeded in eliminating the inelegant chore of creating a dummy file.

You could use a dummy file to your advantage in another way, however. Rather than filling it with random words, you could type in the words you want to search for in the real file. This will maintain the speed advantage of the dummy file while minimizing the chance of accidentally skipping a step in creating the macro.

Nor do you have to confine this trick to operations on multiple files. If the file is long enough and the macro promises to be complicated, it may pay to switch to the empty document, create the macro, switch back to the first document, and let the macro do its job.—M. David Stone

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■ PAUL SOMERSON

USER-TO-USER

Simplify batch file branching, pipeline DOS commands, keep track of your backups, and hide/unhide your important files.

CASE CLOSED

The GETYES.COM batch branch technique relies on Y or N responses and works only if the number of choices is small. A better method for branching is to adapt the GETKEY.COM program on which GET-YES is based.

GETKEY reports different IF ERROR-LEVEL values for upper- and lowercase letters. It's smarter to add a line in GET-KEY that will convert all lowercase letters to uppercase. To do this, use a pure ASCII word processor (such as *WordStar*'s N mode) or DOS's COPY.COM to create a script called GETFIX, containing the lines

```
N  GETKEY.COM
A
MOV AH,Ø
INT 16
AND AL,DF
MOV AH,4C
INT 21

RCX
A
W
Q
```

Then create the GETNEW.COM file by putting GETFIX on the same disk as DE-BUG.COM (2.0 or later) and typing

```
DEBUG < GETFIX
```

GETNEW.COM will let you work with just capital-letter values, reducing the IF ERRORLEVEL tests by half. The example in Figure 1 will let you type in either A, B, or C (or a, b, or c) and will then fig-

```
ECHO OFF
:MENU
ECHO ----------------------------
ECHO Hit A, B, or C (or a, b, or c)
ECHO -- or hit Q (or q) to quit --
ECHO ----------------------------
GETNEW
IF ERRORLEVEL 82 GOTO OOPS
IF ERRORLEVEL 81 GOTO END
IF ERRORLEVEL 68 GOTO OOPS
IF ERRORLEVEL 67 GOTO C
IF ERRORLEVEL 66 GOTO B
IF ERRORLEVEL 65 GOTO A
GOTO OOPS
:C
ECHO YOU HIT A C
GOTO MENU
:B
ECHO YOU HIT A B
GOTO MENU
:A
ECHO YOU HIT AN A
GOTO MENU
:OOPS
ECHO WRONG...
GOTO MENU
:END
```

Figure 1: *Sample batch file that uses GETNEW.COM to return uppercase IF ERRORLEVEL values regardless of whether you enter the upper- or lowercase version of a letter.*

ure out with a minimum of tests which keys you hit.

While reducing the number of IF ER-RORLEVEL tests will speed up batch file execution, you can make your batch files run much faster by running them out of RAMdisks and arranging the tests properly. Since batch files search for labels from the top of each batch file, put nonessential statements at the bottom (and GOTO them), and put the labels that users are most likely to choose nearest the top.

Finally, don't exit with an :END label at the end of the batch file, which is the most time-consuming search of all. In-

stead, execute a dummy batch file. Since DOS doesn't allow nesting of batch files, this will drop you to the DOS prompt.

Gary Later
Buellton, California

ANDing any ASCII value with 223 (hex DF) will capitalize lowercase letters and leave uppercase letters alone. The logical AND operation works by comparing two values (the example below compares 1 bit at a time) and returning a 1 only when both values are nonzero.

```
1 AND 1 = 1
1 AND Ø = Ø
Ø AND 1 = Ø
Ø AND Ø = Ø
```

223 equals binary 11011111. Capital A (decimal 65) is binary 01000001, while lowercase a (decimal 97) is binary 01100001. The AND operation on these numbers could be represented as

```
    01000001 (65)
AND 11011111 (223)

    01000001 (65)
```

```
    01100001 (97)
AND 11011111 (223)

    01000001 (65)
```

ANDing either a 0 or a 1 with 1 in effect leaves the value alone, and ANDing both a 0 and a 1 with 0 in effect turns the value into a 0. The binary number 11011111 forces the 2^5 bit—the sixth one from the right—to become a 0 and leaves all the

■ USER-TO-USER

other bits the way they were. (The rightmost bit is 2^0; the leftmost is 2^7.)

The only difference between a lowercase letter and its capital counterpart is that the 2^5 bit is "set" ($=1$) in the lowercase version. ANDing it with 11011111 "unsets" the bit, changing it to a 0 and lowering the ASCII value by 32.

To reverse the powers and turn capital letters into lowercase ones, use the logical OR operation to OR a value with 32.

```
1 OR 1 = 1
1 OR 0 = 1
0 OR 1 = 1
0 OR 0 = 0
```

32 equals binary 00100000. Since ORing either a 1 or a 0 with 0 in effect leaves the value alone, and ORing either a 1 or a 0 with 1 in effect turns the value into a 1, the binary number 00100000 forces the 2^5 bit to become a 1 and leaves all the other bits the way they were.

This "sets" the unset 2^5 bit in uppercase letter, changing it to a 1 and raising the ASCII value by 32.

```
 01000001 (65)
OR 00100000 (32)
 01100001 (97)

 01100001 (97)
OR 00100000 (32)
 01100001 (97)
```

Mr. Later's GETNEW.COM is a significant improvement over the previous GETKEY.COM routine. Using GETNEW in your batch files will let you offer 26 choices—almost certainly enough—while keeping the number of IF ERRORLEVEL tests to a minimum.

Of the other batch file enhancement techniques suggested, by far the most important is to run any branching batch file from a RAMdisk. The VDISK.SYS "virtual disk" comes free with DOS and is smart, flexible, and extremely easy to use. You don't even have to change any system board DIP switch settings to take advantage of a RAMdisk's speed gain.

One more note—as User-to-User readers know, DOS in fact does allow batch file nesting. To do so, preface the name of the batch file to be nested with COMMAND /C, which runs it out of a secondary com-

mand processor.

PIPELINE EXECUTION

The DOS manual defines piping (which is invoked with the | symbol) as "the chaining of programs" but shows only how to redirect the output of DIR through SORT and FIND.

> ■ Of the batch file
> enhancement techniques
> suggested, by far the most
> important is to run any
> branching batch file from
> a RAMdisk.

You can also use piping to execute several programs or commands in sequence. For instance, if you had a GAMES subdirectory and a program in it called CHESS .COM, you could first change directories and then run CHESS by typing

```
CD GAMES | CHESS
```

If you had another game called CHECKERS.COM in the same subdirectory, you could do the above and then run CHECKERS immediately after typing

```
CD GAMES | CHESS | CHECKERS
```

Nathan Eide
Jackson, Michigan

While this doesn't work with all DOS commands, it does let you string certain operations together into one line. For instance, if you wanted to create a subdirectory called TEST, copy all the files from your current subdirectory into it, log into it, and then, to see a directory listing, type

```
md \test | copy *.* \test | cd \test | dir
```

■ USER-TO-USER

BACKUP DATER

The excellent article on backups in *PC Magazine* (PC Lab Notes, Volume 5 Number 11) highlighted the necessity of making archive copies of your work. However, when you're shuffling floppies in and out of a PC all day, you can lose track of which disks you've backed up and which you haven't.

To get around this problem, create a tiny file on your disk called BACKD_UP ON. One way to do this is to get into BASIC and type (directly, without line numbers)

```
OPEN "O",#1,"BACKD_UP.ON":CLOSE
```

and then hit Enter. Copy this file to your disks and correct the time and date of the directory listing with the command

■ **When you're shuffling floppies all day, you can lose track of which disks you've backed up. To get around this problem, create a file called BACKD_UP.ON.**

```
TYPE BACKD_UP.ON > BACKD_UP.ON
```

This assumes you set your system date and time correctly, of course. Then perform the actual backup process. Later, by looking at the date in the directory listing for BACKD_UP.ON, you'll be able to tell at which point during the day you backed up the disk.

Leon J. Dworsky
Durham, North Carolina

You don't need BASIC to create the BACKD_UP.ON file; you can do it handily by using COPY CON:BACKD_UP.ON. And while the

```
TYPE BACKD_UP.ON > BACKD_UP.ON
```

file update method is a clever way to change the date, since if you try running the command

```
COPY BACKD_UP.ON BACKD_UP.ON
```

all you'll get is a "File cannot be copied onto itself" error message, an easier way is with the little-used directory updating command

```
COPY BACKD_UP.ON+,,
```

A completely different approach would be to use the DOS LABEL command as a place for a date. To do so, patch COMMAND.COM so that instead of saying "Volume in drive B: is . . ." it would say, "Backed up drive B: on . . . ." Then use LABEL to add the date. DIR would then report "Backed up drive B: on 9-10-86". If you backed up additional files later, you could use LABEL to change the date.

To patch COMMAND.COM, use the DEBUG Search command to find the "Volume in drive" message by typing, at the DEBUG hyphen prompt,

```
S 100 6000 "Volume in drive"
```

In DOS 3.1, the address is 4A66. Use the Enter command to change both the "Volume . . ." message and the "is" that follows. In DOS 3.1, you'd type

```
E 4A66 "Backed up"
E 4A82 "on"
```

Then write the changes and Quit.

NESTED FORs

Trying to nest FOR batch subcommands usually results in a "FOR cannot be nested" error message. The solution is to load a COMMAND/C secondary command processor before the second FOR.

This technique will work more than the two levels deep shown in Figure 2. If you try this technique in direct DOS mode (rather than in a batch file), use single %

signs rather than the double % signs required for batch files.

Barry Sher
New York, New York

One minor point about loading a secondary command processor—DOS doesn't seem especially picky about what COMMAND/C syntax you use. All of the variations below work just fine when inserted into the examples in Figure 2:

```
. . . COMMAND /C FOR . . .
. . . COMMAND C FOR . . .
. . . COMMAND /CFOR . . .
. . . COMMAND/CFOR . . .
```

DISAPPEARING FILES

The PC Lab Notes on rescuing erased files in *PC Magazine*, Volume 5 Number 7,

■ **You can hide system files like CONFIG.SYS, VDISK.SYS, and even COMMAND.COM which can give you a small measure of security.**

sparked new interest in disk sectors. By modifying the PERM.COM and UNPERM.COM programs in Volume 4 Number 25 of User-to-User (see Figure 3), I was able to create HIDE.COM and UNHIDE.COM to hide and unhide any program.

A word of warning—even though you can mass-hide files by creating a HIDEM .BAT file with the single line

```
FOR %%F IN (*.*) DO HIDE %%F
```

you won't be able to unhide all your files

```
for %%a in (1 2 3) do for %%b in (A B C) do echo %%a %%b

for %%a in (1 2 3) do command/c for %%b in (A B C) do echo %%a %%b
```

Figure 2: *The first attempt at nesting FOR subcommands will produce only an error message; to make it work, you must insert a COMMAND/C secondary command processor before the second FOR, as shown in the second example.*

PRODUCTIVITY

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```
        N UNHIDE.COM
        X
        MOV AX,80
        INC BX
        CMP BYTE PTR [BX],20
        JZ 103
        MOV DX,BX
        INC BX
        CMP BYTE PTR [BX],0
        JZ 116
        CMP BYTE PTR [BX],0
        JNZ 10B
        MOV BYTE PTR [BX],0
        MOV CX,DX00
        MOV AL,11
        MOV AH,43
        INT 21
        INT 20

        RCX
        24
        W
        N HIDE.COM
        A 119
        MOV CX,27
```

Figure 3: *Instructions for creating both HIDE.COM and UNHIDE.COM to hide and unhide files. Type* this *in using a pure-ASCII word processor such as EDLIN, or WordStar's N mode—and name it SCRIPT. Make sure DEBUG.COM (Version 2.0 or later) is on your disk, or that you've PATHed to it. Also, make sure you leave a space before the RCX and before the W, and hit the Enter key after each line, especially the last one. Then get into DOS and type DEBUG<SCRIPT to create the files.*

the same way, since global file characters work only on what is actually produced by a directory listing. Also, note that COMMAND.COM will execute a hidden AUTOEXEC.BAT file when booting up.

V. K. Taylor
Barrie, Ontario
Canada

You can hide such system files as CONFIG.SYS, VDISK.SYS, and even COMMAND.COM itself, which can give your disks a fair amount of security. If you do try the mass-hide above, remember to keep UNHIDE .COM on a separate disk or subdirectory.

SHARE YOUR DISCOVERIES

Tell fellow users about your latest discovery through User-to-User, and we'll pay you $50, plus an extra $25 if you submit it on a disk. If you send a disk, please include a printout to ensure against damage in transit. Mail your contributions to User-to-User, *PC Magazine,* One Park Avenue, New York, NY 10016.

■ **CHARLES PETZOLD**

PC TUTOR

Alternative approaches to ECHOing blank lines, blanking the screen with an OUT statement, and avoiding phosphor burn with the EGA.

RESOUNDING ECHOS

Several readers have pointed out that when I proposed using ASCII 255 to get DOS 3.1 to ECHO blank lines (PC Tutor, Volume 5 Number 10), an alternative solution (a patch to COMMAND.COM) had already appeared in our User-to-User column (Volume 4 Number 24).

Being a User-to-User reader myself, I was not unaware of the COMMAND .COM patch. I don't consider it to be a good solution in this case, however. In the first place, the patch doesn't really solve the problem, since for every new DOS version somebody will have to figure out where to put similar new patches.

Second, I believe that ECHO has been fixed in DOS 3.1, so patching COMMAND.COM to duplicate the effect of an old bug just doesn't make sense to me. ECHO should not act differently if it is followed by one blank space or by two blank spaces, as it does in DOS 2.0 through 3.0. The real problem with ECHO is its stupid insistence on issuing "Echo is on" and "Echo is off" messages. If ECHO did not dish out these useless messages, it would simply echo a blank line when entered without a parameter. (The DOS ECHO command is based on its counterpart in UNIX, which has also been plagued by problems. See Kernighan and Pike's The UNIX Programming Environment (Prentice-Hall, 1984) for an extensive discussion of some of the more philosophical ramifications of the ECHO command. The subject is not as simple as you may think.)

Third, in the case at hand, the person who asked about echoing blank lines was involved in maintaining batch files in a corporate environment, where they are used on many different PCs. Patching COMMAND.COM on each of these machines rather than changing the batch files (which require periodic redistribution anyway) didn't seem to me to be a reasonable approach. And finally, I thought my use of EDLIN, with its redirection of standard input, illustrated some valuable techniques that could be applied in other circumstances where changes must be made in several different files.

My recommendation is to change the ECHO statements to echo an ASCII 255 (which displays as a blank) is not the only good fix, however. Several readers also wrote in pointing out that

ECHO.

will print a blank line, as will also

ECHO:

■ **To print blank lines you can use a slash, backslash, double quote, left or right bracket, or a plus sign immediately following the word ECHO.**

Both are cleaner and much easier to create with most text editors. Note that the period and colon must immediately follow ECHO.

William A. Robinson of Solon Mills, Illinois, who has clearly done extensive research into the problem of printing blank lines with ECHO, reports that you can also use a slash, backslash, double quote, left or right bracket, or a plus sign immediately following the word ECHO. What all these characters have in common is that they may not be used in file or command names (thus they obviously aren't part of the command), they are not delimiters, and they serve no other purpose on a command line (as would the angle brackets, for instance). I tested all of them under DOS 3.20 and they work. (Will they work under future DOS versions? Who knows!)

Finally, another reader suggested creating ASCII files containing the text to be displayed and using the batch file to TYPE these files to the screen after turning ECHO off. This is most useful when creating full-screen displays from batch files, since you can put ANSI control sequences in the file for moving the cursor around and highlighting.

There are, then, numerous ways to solve the blank-line ECHO problem under DOS 3.1, and I want to thank everyone who has contributed to the discussion.

IDENTIFYING DISPLAYS

I develop applications with the BASIC interpreter, then eventually compile them with Microsoft QuickBASIC. I use a technique to blank the screen when text is be-

■ PC TUTOR

ing written to it. This results in a nice, professional-looking video screen that flashes on all at once, rather than visibly being drawn one line at a time.

To turn the display off, I use the statement:

```
OUT 984,1
```

and to turn it back on:

```
OUT 984,41
```

This works perfectly with an IBM or compatible color/graphics adapter. The problem is that my programs must also run on some Hercules Graphics Card (and Hercules clones), and my technique just doesn't work with those boards. I also use different video pages in my programs, and these, too, are ignored by the Herc card. How can I identify a Hercules Graphics Card and compensate for the differences?

Bob Gross
Newport Beach, California

I'll bet your technique won't work on regular old IBM Monochrome Adapters, either. The port you are manipulating is the "Mode Control Port Register," which has a different address on color adapters and monochrome adapters (including the Hercules Graphics Card). The Control Port for monochrome displays is at address 952 rather than 984. (In hexadecimal, these addresses are 3B8 and 3D8.)

You can blank an IBM Monochrome Adapter or Hercules Graphics Card with the statement

```
OUT 952,1
```

and unblank it by

```
OUT 952,41
```

but that's not the best way to do it.

The Control Port address is always 4 higher than the I/O address of the 6845 video chip. That port address is a word (2 bytes) stored at the hexadecimal address 0040:0063 in the BIOS data area. So, you can define a variable for the Control Port thus:

```
DEF SEG=&H40
CTRLPORT = 4 + 256 * PEEK(&H64) + PEEK(&H63)
```

Now you can simply use the variable CTRLPORT instead of 984 or 952.

You won't be able to use separate video pages on an IBM Monochrome Adapter or

the Hercules Graphics Card, however; so, unless you want to write alternative code for the monochrome boards, it's easier to avoid using video pages altogether. (If you must use video pages, you can still use the value of CTRLPORT to also identify the type of adapter.)

In general, however, the best way for your programs to identify the video display is to ask the user on-screen. This is nothing to be ashamed of. I think you'll find that most software that does anything beyond plain vanilla text output requires some sort of installation program where the user must identify his display. True, some really big-league stuff like Microsoft Word can adapt to different displays without being told, but then we're talking about a 44K WORD.COM program (in Version 3.0) that identifies displays and provides drivers for them. We're also talking about programs by experts in the field.

Further, we're about to see a real explosion in video adapters, and it's going to get tougher and tougher to write programs that work with all of them. The EGA is just the beginning. (And by the way, the above technique of blanking the screen won't work on an EGA, but it won't do any harm, either.) This is one reason why the graphics device interface of Microsoft Windows is so important to the future of the PC. Windows takes on the responsibility of dealing with the hardware so that you can concentrate on the program.

EGA SCREEN BLANKER

A number of PC Tutor readers have castigated me for recommending that EGA users with monochrome displays prevent monitor phosphor burn simply by using the brightness control rather than by using a resident "screen-blanking" utility (see "Burning in a Screen Image," PC Tutor, Volume 5 Number 12). Some clearly felt slighted by my "flippant" suggestion that when their monitors burned out they could buy an Enhanced Color Display, instead. It never occurred to me that some people consider their "green screen" a matter of choice and might actually prefer it to even a high-resolution color display. (I'd figured that monochrome users were more to be pitied than censured for having to endure the short-sighted decisions of their DP departments.)

■ PC TUTOR

```
N EGABLANK.COM
A
JMP 0153 ; JMP INITIAL
DW 0,0
DW 0,0
DW 0
CS: ; NEWINT8.
CMP WO [010A],#80 ; Check COUNTDOWN
JE 0122 ; If zero, DONOTHING
CS:
DEC WO [010A] ; Decrement COUNTDOWN
JNZ 0122 ; If not 0, DONOTHING
PUSH AX
MOV AL,#0 ; Byte to turn off
CALL #142 ; Call ONOFF
POP AX
CS:
JMP FAR [0102] ; Jmp OLDINT8
CS: ; NEWINT9.
MOV WO [010A],#80 ; Check COUNTDOWN
JNE 0136 ; If non-zero, OK
PUSH AX
MOV AL,#2 ; Byte to turn on
CALL #142 ; Call ONOFF
POP AX
CS: ; OK.
MOV WO [010A],2000 ; Set COUNTDOWN
PUSH AX
PUSH DX ; ONOFF.
PUSH AX
MOV DX,03BA ; Reset flip-flop
IN AL,DX ; for monochrome
MOV DX,03DA ; Reset flip-flop
IN AL,DX ; for color
MOV DX,#3C0 ; Attribute Port
POP AX
OUT DX,AL ; Turn on or off
POP DX
RET
MOV AX,3508 ; INITIAL.
INT 21
CS:
MOV [0102],BX ; Save OLDINT8
CS:
MOV [0104],ES
MOV DX,#18C ; Set NEWINT8
MOV AX,2508
INT 21
MOV AX,3509
INT 21
CS:
MOV [0106],BX ; Save OLDINT9
CS:
MOV [0108],ES
MOV DX,#127 ; Set NEWINT9
MOV AX,2509
INT 21
CS:
MOV [010B],#0 ; Byte for resident
INT 27 ; Terminate
R CX
86
W
Q
```

Figure 1. *Use DEBUG with this script file to create EGABLANK.COM, an automatic screen-blanking utility for the Enhanced Graphics Adapter.*

OK, OK, I got the message. Figure 1 contains a script file that will create a resident screen-blanking utility for the EGA. Once EGABLANK is loaded, if you don't type anything for 7½ minutes, it will blank the screen. Typing anything on the keyboard restores the display to normal.

You can create EGABLANK.COM by typing the lines from Figure 1 into an ASCII file called EGABLANK.SCR. (You don't need to type in the semicolons or anything to the right of them; these are comments to help you understand what's going on in the program.) When you have EGABLANK.SCR done, run

```
DEBUG <EGABLANK.SCR
```

and DEBUG will create EGABLANK .COM for you. Then load EGABLANK and try it out by sitting in front of your PC for 7½ minutes without doing anything until the display goes blank.

You can change the amount of time EGABLANK waits before blanking the screen by changing the hexadecimal value 2000 in the line

```
MOV WO [010A],2000
```

to something else. A value of 1 will blank the screen every 55 milliseconds. Going up to FFFF gives you about an hour before the lights go out.

This program is only for the EGA and EGA compatibles. It will not work with other adapters, though it won't harm them, either. While it is really intended only for the monochrome display (these are the ones susceptible to phosphor burn), it will also work with a color display attached to an EGA. Under extremely unusual circumstances, it could interfere with a program engaged in setting the EGA palette registers, but that contingency is so remote I wouldn't worry about it.

What I would worry about is this: EGA-BLANK will not work with any programs that entirely steal the keyboard interrupt, since it then has no way of knowing when keys have been struck. If you have any of these programs, you probably know about this, since other resident programs won't work with them either. Some more sophisticated commercially available screen blankers continually check the contents of the screen for changes to get around this problem, but that would be beyond the scope of a simple remedy.

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SPECIAL REPORT: LASER DRIVES The same technology that is causing a revolution in the audio entertainment world is asserting itself in the world of the PC—but for different reasons. John Helliwell presents an overview of write-once, read-mostly (WORM) laser drives and explains how their potential database applications can be useful with a PC.

THE PLOTTERS KEEP COMING As high-quality graphics become more and more a part of many work environments, interest in plotters continues unabated. Since last December, when PC Magazine reviewed 24 plotters, many new models have been introduced. In the first of a two-part survey, Glenn Hart reviews five desktop plotters that accommodate paper ranging from 8½ by 11 inches to 17 by 22.

SPREADSHEETS AFTER 1-2-3 Can any spreadsheet package challenge 1-2-3? And come away looking good? Jared Taylor reviews three inexpensive programs that aim to give 1-2-3 a run for its money.

BYTE-LEVEL EDITING Using the DEBUG program on your DOS disk is one way to recover erased files, change any byte on any disk, or even disassemble programs to see how they work. But all these tasks are far easier with a byte editor program. Winn L. Rosch reviews six such programs and explains their many uses.

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